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2. Authors will receive gratuitously twenty-five reprints of their articles. If a greater number is desired,—notice of which should be given at the head of the manuscript,—only the additional cost of presswork and paper will be charged to the author.

3. In preparing manuscript for the compositor it is requested that the following rules be adhered to:

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NOTICE TO OUR READERS.

The ARCHIVES OF OPHTHALMOLOGY contain *original papers* on all branches of ophthalmic surgery, and *original reports* on the progress of ophthalmology. The original papers occupy from two thirds to three fourths of the space; and their scope embraces all subjects of scientific and practical interest connected with this department of medicine.

The object of the ARCHIVES is to guard, solidify, extend, and diffuse the stock of acquired ophthalmic knowledge by recording the constant addition of new observations, investigations, methods and means of examination, clinical experience, instruments and remedies, and further by taking part in the discussion of the questions of the day with a spirit alike conservative and progressive.

Particular attention is paid to the preparation of the Report on the Progress of Ophthalmology. The report is intended to furnish a *complete, systematic, and early* review of the current ophthalmological literature of the world. It has been necessary to divide the work of its preparation among a number of collaborators according to the following arrangement :

Dr. H. MAGNUS, professor at the University of Breslau (22 Tauentzien Strasse) :

1. *General Ophthalmological Literature :*
   - *a.*—Text-books (not abstracts, but notes pointing out what is new and characteristic).
   - *b.*—Monographs and papers on historical, statistical, and general subjects ; reports on societies and hospitals.
   - *c.*—Periodicals on our specialty (short notices of their character, time and place of publication, the titles of the original papers, with the names of their authors).

2. *General Pathology, Diagnosis, and Therapeutics*, including new instruments, apparatus, and remedies.
3. *Normal Anatomy and Physiology*, including color-blindness.

Dr. C. HORSTMANN, lecturer at the University of Berlin (Potsdamer Strasse 4):

1. *Anomalies of Refraction and Accommodation.*
2. *Eyelids.*
3. *Lachrymal Apparatus.*
4. *Muscles and Nerves.*
5. *Orbit and Adjacent Cavities.*
6. *Conjunctiva, Cornea, Sclerotic.*
7. *Injuries and Foreign Bodies of these parts.*

Dr. A. NIEDEN, of Bochum, Westphalia:

1. *Uveal Tract*, including glaucoma.
2. *Refracting Media*, including the lens.
3. *Retina and Optic Nerve.*
4. *Injuries and Foreign Bodies of these parts.*
5. *Ocular affections in connection with general diseases.*

In order to obtain complete and recent reviews on the non-German ophthalmological literature, special reporters have been selected for different countries, who will send monthly abstracts of all local ophthalmological publications to Dr. C. Horstmann, of Berlin, the editor of the Report. Dr. Horstmann will distribute these abstracts among the German reporters according to the above plan, in order to preserve the systematic arrangement, which we think of paramount importance.

The special reporters are:

For America: Dr. SWAN M. BURNETT, 1734 K Street, Washington, D. C.

For Great Britain and Ireland: Dr. C. E. FITZGERALD, 27 Upper Merrion Street, Dublin.

For France and Belgium : Drs. E. MARCKWORT, and P. VON MITTELSTÄDT, 10 Chaussée de Malines, Antwerp.

For Italy : Dr. DANTONE, Rome.

For Russia : Prof. HIRSCHMANN, of Charkow.

For Scandinavia : Drs. OLE BULL and SCHIÖTZ, Christiania.

In the interest of our readers, who are scattered over the whole world—and whom, like ourselves, we desire to keep informed of all advances in ophthalmology,—furthermore in their own interest, authors of ophthalmological works are requested to send reprints, duplicates of journals, or copies for reviewing, to one of the above-named reporters, or to the editors or publishers of the Archives, according to their convenience.

The abstracts of American ophthalmological literature formerly appeared under a special head, but are now embodied in the systematic Report. Text-books may be specially noticed.

The number of good papers offered us for publication has increased to such an extent that it is no longer possible to translate all of them unabridged. Whenever a German paper is condensed in the English version, or *vice versa*, it will be so stated. Should any one of our readers wish to recur to the original, the editors will always take pleasure in sending it for reference.

Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the ARCHIVES, and are solicited.

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VOL. XVII. No. 1.

UNITED STAT
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ARCHIVES OF OPHTHALMOLOGY.

REPORT OF ONE HUNDRED CATARACT EXTRACTIONS AT THE PRESBYTERIAN EYE, EAR, AND THROAT CHARITY HOSPITAL.

By E. OLIVER BELT, M.D., Resident Physician.

DURING the past eighteen months considerable attention has been called to the after-treatment of cataract cases by closure of the lids with simple adhesive strips to the exclusion of compresses, bandages, etc. As this mode of dressing, though an old one, is quite a departure from the established customs of the present day, I thought perhaps it would be of interest to hear the result of our experience at the Presbyterian Eye, Ear, and Throat Charity Hospital, where Prof. J. J. Chisolm has given this method a thorough trial. My report embraces only the last one hundred extractions of senile cataracts, though a number of them were complicated with glaucoma, nerve atrophy, and other fundus troubles, which decrease the good results materially.

Most of the operations were performed according to a modification of v. Graefe's linear-extraction method. But in four cases the lens was extracted without iridectomy, and in three the capsule was removed with the lens.

Of the one hundred patients fifty-nine were males and forty-one females; eighty-six white and fourteen colored. In thirty-seven cases both eyes were closed with silk isinglass plaster, and in sixty-three cases one eye was left open.

A large majority of our patients were discharged the fourteenth day after the operation, many of them to go to homes hundreds of miles away. Usually their eyes were tested the day before their departure, that being our only opportunity of examining them. The degree of vision attained that soon after the operation was by no means as good as they ultimately received. We frequently found in those living near, who had been discharged with $V \frac{20}{c}$, $V \frac{20}{xxx}$ or $V \frac{20}{xl}$ several months later. Accordingly, having to test their vision so soon after the operation, and knowing that it would not be a fair and accurate estimate of the final result, I have not followed the usual classification in tabulating the results, but think the following practically as definite as could be obtained under such circumstances.

In the visual results four divisions are made: (1) Good vision, in which are included all cases getting from $V \frac{20}{xx}$ to $V \frac{20}{cc}$. (2) Improved vision, those which have less than $V \frac{20}{cc}$, but can see to get about and read large print. (3) Vision not improved, those having no more than light perception, owing to closed pupils, fundus troubles, etc. (4) Failures, cases in which the eye was lost or in such condition that no subsequent operation could restore sight.

The majority of the operations were performed by Prof. Chisolm, but quite a number by Dr. Herbert Harlan.

INFLUENCE OF AGE ON THE VISUAL RESULT.

	Good vision.	Vision improved.	Vision unimproved.	Failure.	Total.
Under 50 years of age	9	2	1	1	13
Between 50 and 60 years of age	14	1			15
" 60 " 70 " " "	28	3	1	1	33
" 70 " 80 " " "	27	1	1	2	31
" 80 " 90 " " "	4		1		5
" 90 " 100 " " "	1		1	1	3
Total	83	7	5	5	100

Age seems to have had but little influence upon the result, except in cases accompanied by much debility; in those we sometimes found a tardy closure of the corneal wound.

INFLUENCE OF HAVING ONE OR BOTH EYES CLOSED.

	Good vision.	Vision improved.	Vision unimproved.	Failure.	Total.
Both eyes closed	29	2	2	4	37
One eye closed	54	5	3	1	63
Total	83	7	5	5	100

INFLUENCE OF COMPLICATIONS UPON THE RESULT.

	Good vision.	Vision improved.	Vision unimproved.	Failure.	Total.
Vitreous lost	7		1		8
Capsule removed with lens	2		1		3
Capsular deposit	5	6			11
Other complications	2		1	1	4
Smooth extractions	67	1	2	4	47
Total	83	7	5	5	100

As will be readily perceived, eighty-three per cent. received good sight, and ninety per cent. were benefited.

That we should have had better results in the cases in which one eye only was closed was rather surprising and unlooked for. To have one eye open is of inestimable value as regards the comfort of the patient, enabling him to walk about his room, eat without assistance, and dress and undress himself. These great advantages could have been surmised, but whether the results would be as good was doubtful, and the experiment was made with considerable anxiety.

One case after another was so treated, and the year's work has demonstrated that not only have the discomforts of the patient been reduced to a minimum, but a higher percentage of good results has been attained thereby. With both eyes closed the patient was uneasy and anxious. He could not turn one way or another to wait upon himself without the fear of striking his eye or stumbling over articles of furniture. He had to be assisted in taking his food, and in dressing and undressing, and as the days passed slowly by he became more irritable, and in a general condition not conducive to a good result. With one eye open all of this is avoided. He is not in a constant state of fear, but is able to move about his room at pleasure, see and entertain his friends, and keep in good spirits.

INFLUENCE OF COMPLICATIONS UPON THE RESULT.

In eight cases vitreous escaped during the operation; in some before the extraction of the lens, and in others after. However, good vision was obtained in seven cases. In the one case in which vision was not improved, the patient was over ninety years of age, in very feeble health. There was tardy closure of the corneal wound and some kerato-iritis.

There were four extractions without iridectomy, and though good vision was obtained in all, there was some iritis in each with herniæ of the iris in two. Eserin was used in all. In three cases the capsule was removed with the lens, getting good vision in two and vision unimproved in one, owing to choroidal atrophy.

There was sufficient capsular deposit in eleven cases to interfere somewhat with vision, but in five good vision was obtained, and improved vision in six. A second operation would probably result in good vision for these also.

In four cases there were other complications, which resulted with good vision in two, vision not improved in one, and one failure.

Of seventy-four smooth extractions sixty-seven obtained good vision.

Of seventy smooth extractions not complicated by fundus troubles prior to the operation, only three were lost, one by panophthalmitis; giving good vision in 95 per cent.

In seven cases vision was improved, but under $\frac{20}{cc}$. In one of these cases good vision was not obtained owing to glaucoma. In five capsular deposit interfered with good vision, and iritis in one.

Of the five cases not improved, the first was due to intraocular trouble not clearly made out; the second to choroidal atrophy; the third to nerve atrophy; fourth to kerato-iritis, sequel of difficult extraction of lens, with escape of vitreous, patient ninety-one years of age, and in feeble health; fifth due to closed pupil from iritis.

The five failures I give in detail.

1st. Mr. R., ninety-two years of age, feeble health, and nervous. Was very restless during the operation, and much manipulation was required to get the lens out. Both eyes were closed by adhesive strips; suffered nightly from time of operation, and had to have morphia to relieve pain. When the strips were removed the fifth day the pupil was closed with lymph, the result of iritis. Left the hospital the fourteenth day, eye still painful and pupil filled with lymph and blood.

2d. Mrs. A., aged seventy-one. In poor health and deep grief from recent loss of husband; cataract had been forming for years and was over-mature. Operation was smooth, and both eyes were closed with strips; suffered some pain at times for several days, which was relieved by morphia and sodium salicylate internally, and atropia locally. Could see quite well when she left the hospital, but getting wet a few days later, iritis ensued and the eye was lost.

3d. Mr. B., aged thirty-nine. Much emaciated from diabetes mellitus, with which he had been suffering for several years. Three weeks prior had cataract removed from left eye with perfect result. $V \frac{20}{xx}$. Operation on right eye was smooth. Both eyes closed with strips. Eye was lost by kerato-iritis.

4th. Mr. B., sixty-five years of age. Cataract in each eye, mature in the left. Extraction of the lens was under cocaine. Both eyes were closed as usual by strips, which were removed the sixth day; cornea clear and pupil well dilated, under atropia, but the eye was much injected, and masses of lymph seen in vitreous. Eye was destroyed by hyalitis.

5th. Mrs. B., aged seventy-four. In feeble health, cataract in each eye. Lens extraction smooth. Commenced to suffer immediately after the operation, and third day lids began to swell, and the eye was lost by panophthalmitis. A few days before she was operated upon several boys from a reformatory school had been received into the hospital suffering with purulent ophthalmia, with iritic herniæ. Iridectomies were performed on them, and this case being operated upon about the same time, seemed to be one of contagion.

MODE OF OPERATION AND TREATMENT.

Patients are usually operated upon the day they arrive at the hospital, undergoing no preparatory treatment whatever as to dieting, etc. The operations are performed in a well-lighted operating-room, with the patient upon a table of suitable height and width. I think the table is preferable to a bed, as with the former you can get easily around your patient at the head or on either side, as is necessary and most convenient in the progress of the operation. You are not in a constrained stooping posture, but always have your patient at an agreeable height to which you are accustomed. A 2 % solution of cocaine is instilled into the eye a few minutes before the operation is begun. As soon as anæsthesia is produced, the lid speculum is introduced and the eye flooded with a solution of biniodide of mercury, $\frac{1}{20000}$. The liquid comes in contact with every part of the mucous lining of the eyeball and lids. The corneal section is then made usually large, the iridectomy small. The capsule is opened quite freely, as a rule by a horizontal incision over the upper margin of the lens. The lens is expelled by gentle pressure with the rubber spoon on the lower margin of the cornea. Great care is taken that no cortical substance, or shreds of iris or capsule are left in the corneal wound. The eye is again suffused with the biniodide of mercury solution, and usually a few drops of atropia instilled. The speculum being removed, the lids are gently closed, and a thin piece of silk isinglass plaster one and a half inches long by one inch wide applied. This extends from just under the brow to the cheek, and covers the lids entirely, except a small space at the inner canthus for the escape of secretion and instillation of drops.

The silk isinglass plaster is preferable to the gold-beater's skin, as the latter was frequently torn in two before the eye was in condition to be opened. As soon as the plaster was dry and firmly adherent, the patient, usually with one eye open, walked to his room, sometimes up two flights of stairs, and was then allowed to sit up or lie upon his bed as he felt disposed. Many of our patients during the entire course of treatment only retired to their beds at night. The rooms are provided with blue window shades to keep out the harsh light. Patients are instructed not to read or use their open eye any more than necessary, especially the first few days. The strip is not removed usually before the fifth day, though in a number of cases it came off the third or fourth day, and was not replaced, the patient not suffering by it. If during this time any mattering of the eye is noticed, a solution of bichloride of mercury, $\frac{1}{4000}$, is used quite freely, dropped in at the inner canthus without removing the strip; also atropia when there is pain. In those of a rheumatic tendency several doses of salicylate of soda are given, which relieves very promptly. Mercury is given when syphilis is suspected.

The window shades are raised by degrees after the strip is removed, and usually by the fourteenth day the patient is not annoyed by full daylight, and is ready to be discharged from the hospital. In a number of cases the adhesive plaster was applied to patients who had had one eye previously operated upon for cataract when compresses and bandages were used. They much preferred the adhesive strip.

I have heard the idea advanced that detachment of the retina was much more apt to occur after extraction of the lens, when the eye was closed by the simple adhesive strip, than when closed by a compress and bandage; and especially in cases in which there was escape of vitreous. This is somewhat plausible, but we have not found a detached retina in any case so treated, and in a number of them vitreous escaped in large quantities. On the other hand, I think the good of the bandage, in preventing lessened tension and consequent retinal detachment, is more than counterbalanced by the harm resulting from pressure on the cornea, displacing the edges of the corneal wound and sometimes forcing a fold of iris through the wound. This will be better understood by quoting from an article by Dr. Chisolm on the "After-Treatment of Cataract

Cases,"[1] in which he says: "The front of the eye is the prominent part of an elastic ball. When pressure is made upon it, the prominence must be pressed in, and the equator of the ball necessarily bulged out. When the eye has been cut open near the line of the equator, as in corneal section for cataract, any pressure upon the eyeball by a well secured compress must tend to displace the base line, and disturb the nice adjustment of the lips of the corneal incision, which the closed lids had effected." This would necessarily cause a more tardy closure of the corneal wound, and a greater tendency to iritis. The adhesive strip acting as a splint to the lids, with equal pressure at every point, is a perfect support, and tends to keep the lips of the wound in perfect apposition, without displacing the iris, or forcing shreds of capsule into the wound.

USE OF ANTISEPTICS.

As previously stated, the eye is thoroughly washed with the biniodide of mercury solution when the operation is performed, and afterwards, upon the slightest indication of trouble, the solution of bichloride of mercury, $\frac{1}{4000}$, is used very freely. This solution is prepared from compressed tablets made by J. Wyeth & Bro., which contain about equal quantities of mercury and muriate of ammonia. I have not found this irritating or harmful in any way, and am persuaded that the free use of these antiseptics has contributed not a little to the good results obtained.

In looking over a number of reports of cataract extractions I have found a large number of failures due to sloughing of the cornea, yet during a residence of about eighteen months in this institution I have seen only one case of corneal sloughing follow cataract extraction, and that one was the case of panophthalmitis previously referred to which was clearly traceable to infection.

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[1] Read in the Section on Ophthalmology, Otology, and Laryngology, at the thirty-eighth annual meeting of the American Medical Association.

CASE OF DIFFUSE HYPEROSTOSIS OF THE GREATER WING OF THE SPHENOID — RIGHT SIDE.

By WILLIAM F. SMITH, Chicago, Ill.

Mrs. Captain H., of this city, called on me for professional advice March 10th of this year. The lady is forty-four years old, well nourished, of medium height, and the mother of nine children, two of whom are dead from natural causes, the others perfectly healthy.

She complained that her right eye was constantly weeping; that the weeping was much more noticeable at her menstrual periods, and that the lids of this eye appeared puffy and swollen at such times. She wore glasses (Formula : 180° —0.50 —0.50. ——— 175° —0.75 —0.50.), which had been prescribed for her at a previous consultation, and with which her acuteness of vision had remained normal. She did not, at that time, complain of double images, nor was there any apparent displacement of either eye. The ophthalmoscope revealed nothing abnormal in the fundus of either.

I slit the upper canaliculus with Bowman's probe-pointed knife, and syringed the lachrymal passages with a solution of bichloride, 1 to 4,000. This was repeated several times, when the epiphora disappeared, and the patient discontinued her visits. I noticed at this time a prominence of the right side of the face, but thought it an individual peculiarity, and there was certainly no marked exophthalmus.

October 13th.—She again presented herself, in company with her husband. She stated that a few weeks after her last visit she had noticed a slight diminution of the vision of the right eye. At the same time the swelling, she had before remarked only at her menstrual periods, had become permanent, and had increased slowly, but constantly, ever since. The vision also had continued to fail, till now she could hardly tell the difference between night and day with that eye. Tears flowed constantly. She had said very little to her family about her failure of sight, dreading something serious, which she feared would be revealed by professional examination.

Objectively there was exophthalmus, with a bulging outwards and forwards of the whole temporal region of the right side. The ocular bulb was displaced forwards and towards the median line. When looking in the distance (eyes in the primary position) the right pupil was 25 *mm* from the centre of the crest of the nose. The left pupil was 30 *mm* from the crest, showing the displacement of the right eye to be 5 *mm* toward the median line. The distance from the crest of the nose to the extreme boundary of the right temperal region was 70 *mm*; measured to the left on the same line, it was 60 *mm*. Placing the end of a small ivory rule against the aural helix, just above the tragus, and noting the distance to the summit of the cornea on either side, it was found to be 20 *mm* greater on the right than on the left. There was no displacement upwards or downwards.

A tumor evidently existed involving the outer wall of the right orbit. On questioning the lady and her husband as to the possible causes, I was able, definitely, to exclude any syphilitic taint. The patient had one miscarriage, but it occurred at the second month by injury and fright. She finally called to mind the fact that when she was a child, five years of age, she had been gored by a cow, and thrown several yards. The horn had penetrated somewhere near the right eye, and after that she had been cross-eyed for some months. The effect, however, had disappeared, and she had almost forgotten the circumstance.

As the sequel shows, the end of the horn must have penetrated the right orbit, reaching the orbital surface of the greater wing of the sphenoid.

Ophthalmoscopic examination of the right eye showed complete atrophy of the disk. The veins were narrow, and the arteries hardly visible. There was no swelling of the disk; this is in strong contrast with the condition so often described in conjunction with tumors of the brain. The rest of the fundus was entirely normal, and the media were clear. The atrophy was due to strangulation of the optic nerve trunk at the optic foramen. This fact should have suggested the possibility of a bony growth, but it did not strike me at the time. The fundus of the left eye presented no deviation from the normal condition. The visual power was still perfect with the glass prescribed nearly two years before.

Before deciding on a diagnosis, I concluded to call Dr. Fenger of this city in consultation. The Doctor was kind enough to meet the patient with me the next day. At a point about halfway between the external canthus and the lower body of the external rectus, we passed an exploration needle (after having brought it to a red heat in a gas flame to sterilize it) deeply into the orbit in the direction of the optic foramen. A few drops of bloody serum were obtained, which gave only a negative result under the microscope. A single group of small, spindle-shaped cells were seen, but not enough upon which to found a diagnosis. After careful consideration, an operation for the removal of the growth was proposed, and acceded to.

The operation was performed at the *Emergency Hospital* on the 20th of October.

Thorough antiseptic precautions were carried out as to the person of the patient, the surgeons and assistants, the operating-room, and the instruments employed. Dr. Fenger conducted the details of the operation. We were ably assisted by Dr. Holmboe and Mr. Schwan. The right side of the head and eyebrow were shaved.

An incision, including the periosteum, was made from the external angular process of the frontal bone, downwards along the border of the orbit, across the malar bone, curving backwards beneath the malar process of the superior maxillary. The periosteum was separated from the bone of the outer wall of the orbit as far towards the apex as possible; when a solid mass of bone could be felt projecting apparently from the orbital surface of the sphenoid. A chisel was used to separate the external angular process of the frontal from the frontal process of the malar bone. A strong curved needle, carrying a chain-saw, was passed through the spheno-maxillary fissure from above downwards and around the malar process of the superior maxillary, bringing it out just above the canine fossa. The malar process was sawed away. The upper end of the incision was now extended backward from the superciliary ridge, and the flap thus formed, including the malar bone, was lifted out by breaking the zygoma. The bulb of the eye was amputated just behind the conjunctival ring ; the optic nerve was divided close to the optic foramen, and the entire contents of the orbit evacuated, leaving the cornea and conjunctiva *in situ.* This was done to prevent the subsequent ingress of microbes. The osseous tumor was now seen to occupy nearly one half of the orbital space, and to extend downwards and outwards, and towards the median line. Its entire extent could not be well determined. On using the chisel and mallet it was found that it could be readily removed in chips and shavings. It was evidently not of the eburnated variety ; neither was it spongy in structure. It seemed simply a thickening or hypertrophy of true bone. It was cancellated ; but there were no medullary canals of any considerable extent. In the immediate track of the chisel, white bone surface could be seen, dotted rather sparsely with small red spots—the Haversian canals, and openings of blood-vessels. The bone was chiselled away as deeply and extensively as was deemed prudent. The extent excavated was about 2 inches in a vertical direction, about 2 inches at its widest part, and about ¾ inch deep. A drainage tube was left in the orbit. It passed downwards through the lower extremity of the wound and beneath the malar bone. The separated parts were readjusted in their proper positions, the cut and broken osseous surfaces were united with sutures of chrom-catgut, and the external wound coapted by sutures. A very thorough antiseptic dressing was made to invest the entire side of the head.

The wound healed *per primam intentionen.* Some serum and coagulated blood were found in the wound—rather, drainage tube—on the third day, which was easily dislodged and washed away by irrigation with a solution of bichloride, 1 to 4,000. Not a particle of pus was seen. The stitches were removed the eighth day. The patient left the hospital November 24th.

November 27th.—She experienced violent pain in the region of the growth for some hours. During the night following menstruation appeared, upon which the headache immediately left her. The flow was normal.

December 4th—Careful examination showed that the wound had healed completely. The mucous membranes of the eyelids are intact, and it is possible that an artificial eye may be adjusted later, after a fashion. Very little secretion appears on the mucous surface, as the tear-glands were removed. By palpation of the lids the bottom of the orbit cannot be reached, and the bony surface of the tumor cannot be touched. All the measurements possible to be made from the crest of the nose and the root of the aural helix show the two sides to be entirely symmetrical. The movements of the jaw are somewhat interfered with, though she can masticate her food without difficulty, and the movement is easier than a week ago. There has been considerable dizziness since the operation, which has not entirely ceased.

Dr. Fenger made the following remarks in regard to the case:

"Among the osseous tumors of the orbit, this seems to be a very rare case. The osteomas from the accessory cavities of the nose give by far the greatest contingent to the osseous tumors of the orbit, inasmuch as, out of fifty-seven such tumors collected by Bornhaupt, fifty were osteomas from the cavities mentioned, and secondarily invaded the orbit, while only seven were osseous tumors developed in the wall of the orbit proper. To the latter class, of course, belongs the case here mentioned, but differs from them in many respects, inasmuch as those external exostoses, as Bornhaupt calls them, are usually limited (more or less locally prominent tumors), often with an uneven, nodulated surface, of slow growth; while this was more a diffuse hyperostosis of the whole of the greater wing of the sphenoid and had an even surface. It can hardly be classed among the exostoses; it belongs rather to the diffuse hypertrophies which, when affecting all the bones of the cranium and face, produce the so-called *leontiasis ossea* of Virchow; but in this case it seems limited to the one half of the spenoid bone."

On looking up the literature of the subject of osseous tumors of the orbit, I find some very interesting details. Berlin, in the "Graefe-Saemisch Handbuch," vol. vi., p. 725, 1880, refers to sixty-eight cases reported since 1750. He divides them into three classes; the cellular, partly cartilaginous, and ivory hard. Sixty per cent. form in the roof or upper margin of the orbit; twenty per cent. in the inner wall, and twelve per cent. on the floor of this cavity. All of these may have originated in the contiguous cavities, excepting only one, which invaded the outer wall, and was an exostosis, having its origin on the squamous portion of the temporal bone. In only four of these cases could the tumor be ascribed to the influence of wounds. These include Knapp's interesting report of four cases, read at the International Congress at New York, 1876.

Dr. Bornhaupt, of St. Petersburg, in an article in Langenbeck's *Archiv. f. Chirurgie*, vol. xxvi., p. 589, has collected the reports of fifty-seven cases of osseous tumors of the orbit, which were referred to by Dr. Fenger as above. Of these he has classified seven as "external exostoses." It is doubtful whether all of these properly belong to this classification. At least two of them seem to simulate very closely the case which is the subject of this article. As for the others, it is impossible to say, from the reports, whether they were encapsulated osteomas or not. For purposes of comparison, they are transcribed below; also a few other cases of hyperostosis of the bones of the skull which were reported in detail by an older authority.

24. A servant girl, aged twenty or thirty years, had a tumor of bone which appeared at the upper inner angle of the right orbit. It was the size of a hazel-nut, had been growing slowly during seven months. It displaced the eye downwards and forwards. Canton removed it with a small chisel, and found that it was of ivory hardness on its exterior, but spongy in its internal structure. Recovery followed.

(This history is very indefinite. From the character of the tumor, however, it is probable that it grew from the frontal sinus, and was a true osteoma—not an exostosis.)

25. Two months after a fall from a ladder, in childhood, a tumor formed on the upper margin of the orbit, which appears now upon the patient (a driver forty years old) as a conspicuous, uneven growth of ivory hardness, causing the right orbital margin to project one inch beyond the left. The eyeball is pressed down and forwards; the visual power almost gone. Haynes Walton sawed the tumor away. With the healing of the wound the visual power was completely restored.

(This was a true hyperostosis of traumatic origin.)

26. A seventeen-year-old girl received a blow by a rake, the handle of which entered the orbit. A year and a half later, after the wound had long healed, a broad-based, bony tumor developed

in the upper margin of the orbit, dislocating the bulbus downwards and inwards. Four years after the accident Salzer, after several sittings, removed it in pieces. He first used the chisel and mallet; then the trephine, which he applied six times. The tumor weighed 59.7 *grm.* The wound healed and the eye regained its sight.

The 27th case, classed here, is too indefinite for consideration.

28. Windsor chiselled a bony tumor from the upper and lateral margin of the orbit of a twenty-four-year-old weaver girl, which had developed in fifteen months, and had thrown out a process under the upper orbital margin, and had displaced the eye downwards and forwards. It consisted partly of bone and partly of cartilage (?). Recovery followed.

29. Stephenson sawed from the upper orbital margin of an eighteen-year-old girl a bony growth which looked like an inverted cone. It had developed in three years. A good result followed.

30. Mackenzie attempted to saw from the upper orbital margin of a workman a projecting, sharply defined exostosis. It was the size of a dove's egg, and pressed the eye downwards and forwards. He desisted on account of its hardness, and contented himself with sawing out a wedge-shaped piece. Ten years after the operation the tumor still remained. It lay in the wound, "open to the day." The space from which the wedge-shaped piece had been sawed, three fourths of an inch deep, was unchanged, and appeared as if only lately done.

Of the six cases here transcribed, the third (Bornhaupt's Case 28) is so carelessly reported that the character of the tumor can hardly be conjectured. The author says it developed in the lateral margin of the orbit; yet it "displaced the eye downwards and forwards." The details are so meagre that it cannot be classified. Of the five remaining, two were evidently of traumatic origin. Of the three others any statement as to this important detail has been omitted.

Bornhaupt gives the reports of forty-nine other cases of tumor of the orbit, which had their origin in the neighboring cavities, viz.: twenty-three cases of osteoma from the frontal sinus; eleven cases from the ethmoid labyrinths; ten from the antrum Highmori, and five from the cavities of the sphenoid. When the reports are given with any thing like attention to details, a mucous membrane is always mentioned as covering the tumor; this membrane invested the tumor closely; it did not bridge the furrows, but extended into them, adhering to the bony surface everywhere, and at least the cortical portion of the tumor was always ivory hard. These three points, or characteristics, viz.: (1st) the origin of the tumor from one of the bony cavities, (2d) the encapsulating membrane, and (3d) the ivory hardness, should serve to distinguish the "encapsulated osteomas" from the "exostoses" and "hyperostoses." The osteomas rarely, if ever, have a traumatic origin; the exostoses and hyperostoses nearly always have, and are developed from the periosteum.

In the case of Mrs. H. the tumor, without doubt, developed from the periosteum, but it differs from the osteomas in that it was not ivory hard, it was not enveloped by mucous membrane, and it did not have even a remote connection with any sinus. It was also of traumatic origin. Cases 25 and 26 of the collection of Bornhaupt have all these characteristics in common with it. I have found other analagous cases in the "Handbuch der Praktische Chirurgie," von Dr. Victor Bruns, 1854, p. 533, as follows:

Oesterlen (*Würtemberg. medicin. Correspondenzblatt.*, Stuttgart, 1832, p. 79). A thirty-one-year-old healthy vineyard worker, in felling a tree, received a blow from a beam on the right frontal protuberance, which caused great pain and dizziness, some ecchymosis, but no open wound, so that in half an hour he was able to resume his labors. Shortly afterwards he felt continual burning at this spot, which was increased by bodily exertion. Half a year afterwards an elevation the size of a bean was discovered, which, little by little, increased in height and breadth, so that in twelve years it had reached the size and form of half a goose egg, and in sixteen years the size of two small fists laid side by side, but without any increase of the burning or other casualty. Its circumference was 13½ inches, and its vertical diameter 7½ inches. It included the greater part of the forehead, leaving only the left side free, extended with a sharp boundary to the coronal suture and to the suture of the temporal bone, while its forward, sloping margin extended to the upper edge of the orbit. At the point of its greatest projection it felt like stiff dough. According to information by letter, this patient died, at the age of seventy-six years, from an inflammation of the lungs, without having suffered any diminution of his mental or bodily powers by reason of the tumor, and in spite of the fact that it had continued to increase in all its dimensions. At the section was found, under the unchanged cuticle and at the summit of the tumor, a layer of thickened cellular tissue about one inch deep. The frontal bone proper was plainly recognized, the inner and outer tables of which, as well as the sclerosed diploë, were covered in by the thickened bony formation, which, for the most part, was very compact, but contained numerous canals for vessels, and in which was seen one spot of spongy tissue. A thin, uneven layer of bony, new formation was found on the inner surface, which was also very compact, with the exception of one spot.

Page 536 (v. i.). Himly (de exostosi cranii rariore. Diss. Göttingæ, 1832). Franz H., æt. twenty-four, cobbler, was received in the University Hospital Nov., 1828, for a loss of vision of the left eye, and a loss of hearing of the left ear, from which he had suffered for some years without any visible cause. Notwithstanding, he travelled as a journeyman, had become infected, and had undergone treatment by mercury. After recovery a swelling appeared in the left temporal region, accompanied by dull pain, while, at the same time, the sight and hearing of the right side began to diminish. This constrained him to seek medical advice in Gottingen. The swelling, or tumor, was attached to the bone, was hard, painless, and immovable. The patient was otherwise healthy, lively, and talkative, though complaining of headache from time to time. Little by little cheerfulness, sight, hearing, and his capability of conducting himself diminished, so that finally he seldom left his bed. By the end of September the tumor seemed to reach its greatest size, and then appeared to come to a stand-still. The pupils became entirely immovable; hearing nil; consciousness still persists; speaks in a stuttering manner; headache continuous; once in a while there is great irritability and mania; appetite unnaturally large; almost constant sleep; great satyriasis; finally death in 1831.

The section showed that the tumor was connected with the left parietal bone, from which it passed over on to the contiguous bones. Its external surface contained many depressions and nodules, as well as openings for the entrance and exit of blood-vessels. It reached deeply into the cavity of the skull. The A. meningea media ran in a deep furrow on its inner surface. Upon sawing through it, the outer and inner tables of the skull, with the diploë, were easily recognized, and were perfectly healthy. The outer part of the tumor was more cellular, in the middle, and surrounded externally by a cortical layer several lines in thickness. The inner part contains larger cells, and its cortex is only ½ a line thick. The entire thickness of the tumor was 2 inches 8–10 lines; of which 1 inch 10–11 lines belonged to the outer part; 2–3 lines to the bones of the skull and diploë; while 6–8 lines comprised the inner part of the tumor. In addition to this there lay in the fossa anterior sinistra of the left side of the occipital bone, and between the cerebellum, medulla oblongata, pons Varolii, and the posterior lobe of the cerebrum, a medullary sarcoma of the form and size of a hen's egg, which had no connection with the neighboring parts, excepting with the N. trigeminus, facialis, auditorius, and some blood-vessels which passed with the pia mater into the greater and lesser lobes of the brain.

Page 537 (v. i.). Rognetta (*Revue médicale de Paris*, 1835, p. 706). A twenty-year-old Englishman, two and a half years before, had received a blow of the fist on his right temporal bone while boxing. Upon this spot there arose a tumor of bony hardness, which grew gradually without pain, has a broad base beginning about half an inch from the outer right eyebrow, extending two inches backwards and upwards, and has now attained the size and form of an egg. Patient had never had syphilis. Numerous leeches, in all about six hundred, were applied to it without any result. Afterward a salve of muriate of ammonia and mercury (10 to 1) was rubbed on it for ten minutes morning and evening, and continuous compression was effected by an apparatus so constructed that it could be worn under a wig. After fourteen days of this treatment the tumor was reduced one half. (Further history of the case is not given.)

Page 538 (v. i.). A married woman, thirty-two years old, a midwife, perfectly healthy, has remarked for some years a tumor in the middle of her forehead, which has grown gradually and without pain. At present the tumor has reached the height of about three fourths of an inch, and has a broad base one and a quarter inches in diameter. It is covered with the normal, movable scalp, is hard as bone, and without well defined borders extends toward the neighboring bones. Patient is very anxious to have it removed for a number of reasons. Operation : A vertical incision in the middle line of the forehead from the root of the nose backwards ; separation of the lips of the wound, and the use of the saw from either side towards the centre. The tumor was removed with very little bleeding. The wound was closed, and healed *per primam intentionem*, excepting the lower end over the root of the nose, which secreted some pus, but healed within ten days without throwing out any pieces of necrosed bone. The piece removed is a compact mass of bone throughout.

(This tumor was not eburneous, otherwise the saw would not have had such ready effect upon it.)

Page 539 (v. i.). Emmert ("Lehrbuch der Chirurgie," Bd. II., p. 65, Stutt., 1851). A twenty-two-year-old, strongly built countryman received a blow from the edge of a shovel six years ago. It was on the right side of his forehead, and after the exfoliation of several pieces of bone the wound healed. But after the cicatrization the patient still seemed to be in very unfortunate condition. He suffered from continuous headache of varying severity, frequently recurring vertigo, loss of memory, and fell into a state of melancholy. All possible internal and external remedies, setons in the neck, etc., were used without benefit. The brain difficulty became more marked, so that the patient rarely left his bed at last. The upright position produced vertigo, and a falling to the left. On examination Emmert found the cicatrix confined to the right protuberance of the frontal bones, where was a bony tumor only slightly elevated. He reflected therefore on the possibility of an enostosis existing at this spot, which, on account of the absence of symptoms of brain abscess (?), would account for the headache, and proposed to remove the cicatrized part with the trephine. This was acceded to and the operation undertaken the following day. A piece of bone one inch in diameter, including the tumor and cicatrix, was removed. The dura mater was uninjured and normal in appearance. The trephined piece of bone was of unusual thickness, and presented, on its inner surface, about opposite to the tumor outside, a spicula of bone, perpendicular to its surface, two by four lines at its base, and eight lines long. The diploë at this point had, for the most part, disappeared, and the membrane was sclerosed. Since the bony margin in the opening in the skull was at no point unusually thick, Emmert considered the object of the operation attained, and placed a simple bandage in position. Soon after the operation the headache disappeared, and in the course of the healing of the wound the other annoying symptoms vanished. In six weeks cicatrization was complete, and the previous good health was regained.

Of these twelve cases, including that of Mrs. H., six are known positively to have had a traumatic origin. In the other six the details are so meagre that we are not justified in saying that they too had not developed from injury to bone or periosteum.

Of the forty-nine cases collected by Dr. Bornhaupt, evidence of traumatic origin is adduced in only four encapsulated osteomas, and in these the wounds received may have been only coincidences, with a pre-existing tendency, if not the actual presence, of the tumor.

Osseous tumors of the orbit, therefore, naturally divide themselves into two classes by the following points of difference :

Exostoses and hyperostoses originate from injury of periosteum or bone.	Encapsulated osteomas have a fœtal origin and appear with the development of the bone cavities or sinuses, not later than the thirtieth year.
Are covered with periosteum.	Are encapsulated by mucous membrane.
Have the consistency and histological characteristics of true bone.	Are composed of bone as hard as ivory (eburnea ossa).

These well defined characteristics seem to make the two classes of orbital tumors sufficiently distinct, and also to call for some reason why this distinction should be so well marked. The nasal cavities proper are lined with mucous membrane, though there is, no doubt, a connective tissue (periosteum ?) between the mucous membrane and the bone surfaces. As the cavities in the bone develop by absorption, we could hardly expect to find true periosteal membrane lining them ; though the mucous membrane extends into every part.

While Dr. Bornhaupt argues that the encapsulated tumors, in common with the exostoses, develop from periosteum, he seems to show almost conclusively that the osteomas have a fœtal origin; and in discussing the embryology of the cavities contiguous to the nose he quotes Kölliker as follows: "At first the mucous membrane of the nose folds itself outwards along with one of the cartilaginous side plates covering it, and only gradually comes in contact with the neigboring bone through absorption of the cartilage that envelops it. By further development cavities appear in the bone itself, always lined by the ever-growing folds of mucous membrane." Nothing is said here of periosteum. The cavities in question are developed only after fœtal life, sometimes later than puberty. Dr. Fenger presupposes a periosteal lining, and suggested that "they may develop so that here and there on the periosteum of the cavity is left an embryonal matrix, which may become the point of origin for the encapsulated osteoma."

In none of the records we have seen, however, is it claimed that true periosteum enveloped a bony tumor of ivory hardness. Knapp, in one of his cases, had the composition of the tumor analyzed and found that it very closely resembled true bone; but not any closer than does the composition of the teeth. The teeth are developed from the mucous membrane. Why may not the mucous membrane here, and its underlying connective tissue, by some process of perverted development, be the origin of the encapsulated osteoma?

If this could be admitted, it would enable us to make a still more perfect distinction between those two classes of osseous tumors: those developing from wounded or irritated periosteum, and occurring at any time of life; and those of fœtal origin, developed from mucous membrane with the development of the bone-cavities. The first class belongs to that of exostoses and hyperostoses in general, their position only preventing their removal by ordinary surgical procedure; the second class as easily recognized, but only to be successfully removed when the point of origin of the tumor is made accessible by chiselling away the walls of the cavity till its base can be reached.

CURE OF A DIVERGENT STRABISMUS BY ADVANCEMENT OF THE PLICA SEMILUNARIS TWO DAYS AFTER AN UNSUCCESSFUL PULLEY OPERATION.

By GRANT CULLIMORE, M.D., Atchison, Kansas.

LIEBREICH, in vol. i. of the ARCHIVES OF OPHTHALMOLOGY AND OTOLOGY, maintains that "the caruncle together with the plica semilunaris rests on a ligament which passes from Tenon's capsule to the edge of the orbit." This being true, the annular attachment of the capsule with the belly of the muscle affords a direct connection between the internal rectus and the plica, which furnishes a check to complete loss of the muscle after section, although the lateral attachments may be thoroughly divided.

On the basis of this supposition, Liebreich so modified his tenotomies as to completely separate the plica from the capsule.

An accident which recently happened in the course of an attempted advancement of the internal rectus stimulated me to a practical test of the truth of Liebreich's assertion.

David S. Coburn, aged forty, had since childhood an external deviation of both eyes, most extreme in the right eye, and not so marked in the left eye. The balance of power, however, in the latter eye was considerably in favor of the external rectus. V in R E = $\frac{5}{50}$; V in L E = $\frac{5}{10}$. As a matter of cosmetics, it was decided to operate, and upon section of the external rectus very little correction following, an advancement of the right internal rectus was made.

In the *St. Louis Medical and Surgical Journal*, in Noyes' "Diseases of the Eye," and in the *Ophthalmic Review* for Sept., 1887, there appears an account of Dr. A. E. Prince's "pulley modification" of advancement. Having many times been witness to the success of this method in the hands of Dr. Prince, and having successfully practised it myself, I employed the procedure in this case. A little over-correction was accomplished, so as to compensate for future retraction during cicatrization. The circumstances of the patient were such that confinement of both eyes with the bandage was impracticable, and, besides, I had great confidence in the permanency of my sutures.

The patient returned for inspection the next day, and although the over-correction had disappeared sooner than was desirable, no absolute deviation existed. From the appearance of the parts, however, I had some apprehension as to the result, but allowed the patient to go home and return the next day. To my chagrin, when he returned again, the deviation of the right eye existed quite as extreme as originally. The fault seemed to have been in the application of the "pulley loop." I had not gone deep enough, as Dr. Prince recommends, into the scleral tissue. Here were the possibilities of disgrace before me, and a considerable amount of inflammation and chemosis forbade the reopening of the wound for an attempt to pick up the lost muscle.

Recalling to mind Liebreich's idea, I determined to make the best use of it and advance the plica semilunaris. This I did with a very wide loop suture passed through this tissue with a Tiemann's No. 25 eye needle. The needles, one attached to each end of the thread, were brought out at the upper and lower edges of the cornea, through scleral tissue, considerably internal to a vertical line drawn through the corneal centre. The ends were then tied in a firm knot. Necessarily a great amount of chemosed tissue was puckered at the internal angle from the involvement of so much conjunctival tissue in the suture. But that a conjunctival suture independent of a tendinous attachment such as Liebreich describes could effect a correction, I do not think probable. Of course, there is a continuity of tissue which necessitates traction when a certain tissue area is puckered by a suture, but such traction is not permanent in elastic and loose tissue such as the conjunctiva.

I have no anatomical researches upon which to base my agreement with Liebreich, but the fact that in my case the eye was brought to a position of parallelism by a comparatively superficial suture through the plica, and at the present time—though some months have elapsed—remains so, is certainly good evidence that in my advancement of the plica the muscle itself was brought forward by its connection, through somewhat dense and inelastic tissue, with the semilunar fold.

The effect of the operation, so far as the appearance of the tissue is concerned, is that of a slightly puckered condition of the conjunctiva at the location of the suture. The caruncle is not much displaced forward, and the sunken appearance which sometimes occurs after strabotomies is not present.

A CASE OF DEATH FROM MENINGITIS, THE RESULT OF PANOPHTHALMITIS FOLLOWING A CATARACT EXTRACTION, WITH REMARKS.

By DAVID WEBSTER, M.D., of New York.*

THE operation of cataract extraction is generally considered as involving very little danger to the life of the patient.

The latter is informed that there are several chances out of every hundred that the operation may fail to restore useful vision, and that it may result in the loss of what sight still remains to the eye, and possibly even in the loss of his eyeball, but when he asks whether in submitting to the operation he runs any risk of losing his life, we feel at liberty to assure him that although no operation upon any part of the body is entirely without risk, yet the risk of death from cataract extraction is so small that it is scarcely worth taking into account.

This view I still hold to be the correct one, notwithstanding the fatal result in the unique case I have to report.

Cataract extractions have always been liable to be followed by panophthalmitis, but this form of inflammation, though very painful and always resulting in atrophy of the eyeball, is rarely, if ever, in and of itself fatal. It is true that death has been caused by meningitis following enucleation of eyes while affected with panophthalmitis.

Noyes, in speaking of the treatment of panophthalmitis, says: " Enucleation is sometimes practised, but it is attended with profuse bleeding, unusual reaction, and some degree of danger; a few fatal cases having been reported."

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* Read before the N. Y. State Med. Society, Feb. 7, 1888.

De Wecker, treating of the same subject, says:

"Unfortunately there are cases on record where, after enucleation, the sheath of the optic nerve has been invaded by pus, and where fatal meningitis has quickly supervened."

Mittendorf tells us:

"The greatest charity to the patient would be an enucleation of the eye as early as the disease is recognized, but not after pus has been formed. At this time it is not without danger, as the disease has extended to the meninges in some cases after an enucleation of the eye; this is probably due to the opening of the subvaginal space of the nerve-sheath, which will give an easy access of the purulent matter to the brain."

But I do not find any intimation that the purulent matter may be carried to the brain and a fatal meningitis set up *without* enucleation or any other operation upon the eye affected with panophthalmitis. But this is what must have happened to my patient. He was seen by a member of the staff of the Neurological Department of the hospital, who confirmed the diagnosis of meningitis.

Upon reviewing the case I fail to see how the unfortunate termination could have been prevented.

We do not expect our cataract patients to lose their mental balance, and, removing the dressings, open the recently wounded eye. We do not have them closely watched, day and night, even in private practice. I have little doubt that the exposure of the eye, together with the violence done to it by the patient in removing the dressings, caused the inflammation which resulted in his death, although a certain amount of mental aberration preceded the panophthalmitis.

The case is as follows:

Thomas D., farmer, aged seventy-six, presented himself at the clinic at the Manhattan Eye and Ear Hospital Oct. 28, 1885.

He had lost the sight of his right eye nine years previously from an injury. It was, when we first saw him, in a condition of glaucoma absolutum, having a "ground-glass" cornea, increased tension, and enlarged and "cork-screwy" emergent ciliary blood-vessels. The sight of the left eye had been failing a long while, and more rapidly during the past year. It was the subject of old corneal opacities and immature cataract.

Dr. C. R. Agnew, under whose care the patient placed himself, advised enucleation of the blind eye as a prudent preliminary procedure to the extraction of the cataract from the left.

This operation he performed, with the patient's consent, on Jan. 29, 1886. The patient recovered from this operation without any unfavorable symptom, and returned to his home at the end of sixteen days.

He returned to the hospital for extraction of the cataract, which had become sufficiently ripe, on February 16, 1887.

Dr. Agnew being absent the writer performed the operation. A drop of a solution of eserine was instilled into the eye one hour, and a drop of a 4 % solution of cocaine twenty, ten, and two minutes, before the operation.

The eye was washed with a solution of hydrarg. bichlorid., 1 to 25,000, before and at intervals during the operation.

The lens was extracted through an upward section with iridectomy.

The patient had very little control over the eye, but the cataract was extracted without loss of vitreous or other accident, Dr. George F. Carey assisting by coaxing out the lens with a cystitome.

After the completion of the operation there was collapse of the cornea, the whole of its area forming a concavity, there being an utter lack of resiliency of the eye-walls.

The lens was very dark, and, perhaps, would come under the head of "black cataract."

The eyeballs were greased with white vaseline, a pad of absorbent cotton applied, over this a flannel bandage, and over all the black silk dressing.

When I called to see him two days later I found him with the dressings removed, he having torn them off himself during the afternoon, or since last seen by the nurse. The patient seemed demented and did not remember having removed the dressings.

As the eyelids were neither red nor swollen, and as there was no secretion presenting between them, I thought best not to open the eye. I therefore applied a fresh pad of cotton and tied on the black silk dressing without a roller bandage.

Feb. 19th.—The dressings were removed by the patient twice during the night and once to-day. Still there are no unfavorable symptoms in the eye, but the patient seems to wander in his mind.

Feb. 20th.—On removal of the dressings the eye was found to be watering profusely, and in raising the upper lid, with some difficulty on account of the sensitiveness of the eye and the involuntary resistance of the patient, considerable chemosis was disclosed.

Iced cloths were now applied to the eye, two leeches were applied to the temple, and twenty grains of calomel were administered, to be followed by a saline cathartic in the morning if necessary.

Feb. 22d.—Iced cloths continued ; patient has no appetite, and is very feeble. The calomel moved his bowels gently without the use of any saline cathartic.

Feb. 23d.—The eye to be bathed with hot water for five minutes every hour. The patient to be fed with milk and milk-punches.

Feb. 24th.—The condition of panophthalmitis has fully developed itself. The eye to be sprayed several times daily with sol. hyd. bichlor., 1 to 5,000. Patient sat up some to-day.

Feb. 28th.—Inflammation unabated, urine passed unconsciously in bed, patient vomited and took but little nourishment. Kumyss and milk-punch continued.

March 2d.—Flaxseed poultices applied to the eye. No change in patient's condition except for the worse ; a very little albumen found in his urine. Temperature 99.4°.

March 3d.—Temperature 97.8°.

March 4th.—Temperature 100.5°.

Patient became comatose at 4 P.M. yesterday and remained in this condition until death, which took place March 6th, at 3 A.M.

It will be remarked that the patient developed a condition akin to dementia on the second day, chemosis on the fourth day, well marked panophthalmitis on the eighth day, vomiting with loss of power over his sphincters on the twelfth day, and died on the twentieth day after the operation. No autopsy was permitted.

A CASE OF SARCOMA OF THE CHOROID WITH METASTATIC INFILTRATION OF THE OPTIC NERVE.

By DAVID WEBSTER, M.D., and IRA VAN GIESON, M.D.,
New York.

(*With four figures.*)

CLINICAL HISTORY AND OPERATION BY DAVID WEBSTER, M.D.

The patient, a maried woman, thirty-four years of age, was brought to me by my friend, Dr. C. O. Sahler, of Kyserike, New York, on February 10, 1886. Her right eye was normal, with vision twenty-twentieths, and emmetropic. She said that about five years ago, at times, when she was looking steadily at any object, sparks like fire-flies would appear before the left eye, and not before the right. In April, 1884, she first observed that the vision of the left eye was impaired, and from that time the impairment of vision steadily increased, so that the eye became blind by degrees. Dr. Sahler, being called in, discovered a "lump" about the size of a split-pea growing from the supero-nasal portion of the ciliary region. Some time after that he saw her again, when he found that a second lump had developed adjacent and similar to the first. These two lumps soon merged into one, which has steadily increased in size. There is now a staphylomatous-looking bulging, nearly as large as an eyeball, occupying the supero-nasal, ciliary, and scleral regions, with a second smaller bulging back nearly to the equator of the eyeball in the vertical meridian. The lens is opaque.

There was no pain in or about the eye until about the latter part of December, 1885, and since then the pain has been so moderate as not to demand an anodyne. A sharp pain darts through the eye when the patient is looking steadily at any thing with her right eye.

I made a diagnosis of probable sarcoma of the choroid, and, with the consent of the patient and of Dr. Sahler, enucleated the eye, on the same day, at the Manhattan Eye and Ear Hospital, and placing it in Müller's fluid, had it sent to the pathologist of the hospital, who herewith makes his own report.

The growth had so enlarged the eyeball that I had to slit the external canthus in order to permit its removal from the cavity of the orbit.

I may add that the patient recovered kindly from the operation and returned home at the end of a week.

She has enjoyed the best of health since the operation, showing no signs of sarcoma of the orbit or of any other part of the system.

MICROSCOPICAL EXAMINATION BY DR. IRA VAN GIESON, PATHOLOGIST TO THE MANHATTAN EYE AND EAR HOSPITAL.

At one side of the globe the sclera rises over a bluntly conical, dark-colored, nodular tumor, the basal diameter of which is 21 *mm*, and its height 12 *mm* (figs. 1, 2).

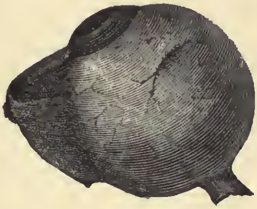

Fig. 1.—Showing a lateral view of projecting portion of the tumor. (Natural size.)

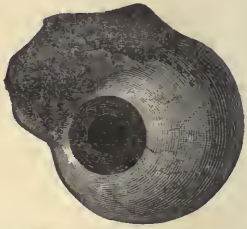

Fig. 2.—Showing a front view of the same. (Natural size.)

The base of this conical projection, anteriorly, involves about one eighth of the sclero-corneal junction, and, extending backward and laterally, covers about one third of the surface of the globe.

A meridional section, including the tumor (fig. 3), shows that the latter occupies about one half of the posterior chamber, and consists of two portions—a larger anterior dark-colored and a smaller posterior light-colored portion. The dark-colored part consists of small spheroidal cells, and of large round and spindle cells, which contain pigment, and lie in a more or less pigmented stroma. Some portions of this darker mass are more deeply pigmented than others, giving the whole a coarsely, mottled appearance.

The smaller light-colored portion is similar in structure to the darker part, but is almost entirely devoid of pigment.

The *cornea* and *iris* are normal. The *sclera* is thinned over the tumor, and contains streaks and clusters of small spheroidal cells, which also extend into the adjacent limbus. The *ciliary body* on one side is considerably reduced in volume by pressure from the tumor, and with its processes is pushed inward toward the lens.

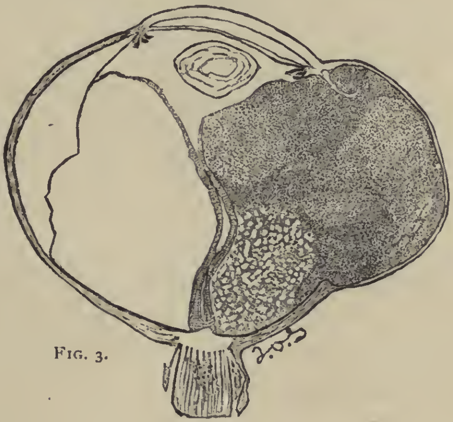

FIG. 3.

The *choroid* on the side of the eye involved by the tumor is apparently absent; the layers of the remaining choroid are pressed together, and the lumina of many of its vessels closed. In places the choroid is adherent to the sclera, which at these places is slightly pigmented. The *retina* is completely detached, and its rods and cones replaced by larger and smaller transparent globules. In some places the topography of the retinal layers is still evident; in other parts the retina is involuted and degenerated.

Grouped together in the spaces between the connective-tissue trabeculæ and the nerve-fibre bundles in one side of the *optic nerve*, there is a limited number of oval and spherical pigmented cells and coarse pigment granules (fig. 4). Where the tumor abuts against the lens the capsule of the latter is replaced by a thin lamina of new formed, richly cellular connective tissue. The peripheral portion of the lens contains concentrically arranged crevices, some of which are filled with clear fluid; others contain variously sized transparent globules and droplets.

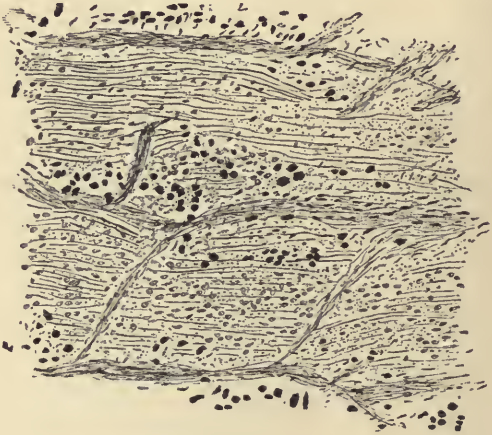

FIG. 4.

ANATOMICAL DIAGNOSIS: *Melano-sarcoma of the choroid with metastasis of the optic nerve;* detachment and degeneration of the retina; partial degeneration of the lens.

OVER-EXERTION OF THE ACCOMMODATION AND ITS RESULTS.

A CONTRIBUTION TO THE ÆTIOLOGY OF GLAUCOMA AND EQUATORIAL CATARACT.

By Dr. W. SCHOEN, Leipzig.

Translated by J. A. Spalding, M.D., Portland, Me.

(*With a lithographic plate, Tab. I.*)

I HAVE already shown, in a paper on the causation of glaucoma,[1] that most of the so-called physiological excavations have no right to the name, but that they are due to dragging of the vaginal processes of the optic nerve and lamina cribrosa from over-exertion of the accommodation.

The proof that I offered was double; first, that this excavation is more or less pronounced in almost every eye in which the accommodation has long been over-exerted, as, for example, in hypermetropia, presbyopia, astigmatism, and in cases of corneal maculæ whenever proper compensating lenses have not been used. The percentage is much higher than that in which the excavation is found in children. Thus, Germann[2] found but 3.63 per cent. in 220 children eyes, whilst statistics based on 1,800 adult eyes, under my personal investigation, vary greatly from this. For example, in 437 eyes in which an accommodative excavation was to be expected, I found the following proportions:

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[1] *Graefe's Archiv*, Bd. xxxi., 4, p. 1.

[2] *Graefe's Archiv*, Bd. xxxi., 2, p. 121.

Excavation.	I.	II.	III.	Total.
Total	8	12	6	= 26
High degree	32	49	43	= 124
Moderate	76	48	52	= 176
Slight	19	19	9	= 47
Absent	16	32	16	= 64
Number of eyes	151	160	126	= 437
Number of persons	76	82	66	= 224

If we reckon the percentages, we find as follows:

Percentage of the so-called physiological excavations:

1. In the 437 eyes in which accommodative excavation was to be expected:

Excavation, on the whole . . .	85 %, *i. e.*, 5–6
Slight to medium excavation. . .	74 %, *i. e.*, 3–4
Extreme, and total excavation . .	33 %, *i. e.*, 1–3

2. In the whole 1,800 eyes of all the patients:

Excavation, on the whole . . .	20 %, *i. e.*, 1–5
Slight to medium excavation . .	18 %, *i. e.*, 1–6
Extreme, and total excavation . .	8 %, *i. e.*, 1–12

Hence, there can be no doubt that, in the majority of cases, the excavation is an acquired one, and that it is found in all stages of development from the slightest trace to the total. There is no substantial difference between the latter and glaucoma simplex.

Its appearance in those eyes upon whose accommodation great strain is made, points at the accommodative process as its cause, and my daily experience permits me to declare "*that the diagnosis of spasm of accommodation can invariably be made in every case of well-pronounced excavation, with red margins around the papilla.*"

My second proof rests upon anatomical preparations from an eye which exhibited well-marked hypermetropia, particularly with a distinct hypermetropic ciliary body, and the so-called physiological excavation. A section shown in the paper above mentioned exhibits a distortion of the vaginal processes and nerve fibres toward each side. This is most pronounced at the spot corresponding to the border between the sclera and choroid, and is entirely different from that in myopia. For whilst, in the latter, all of the coats of the eye are dragged to the temporal side of the optic nerve, so that the scleral ring is pulled outward in comparison with the axis of the optic nerve, in the hypermetropic section, on the contrary, the axis of the nerve, the width of the inner scleral ring, and its situation relative to that axis are all unchanged, and the vaginal processes are dragged toward *every side* from the axis of the nerve. The muscle of accommodation performs this task by means of its tendons, which consist of the lamellæ of the suprachoroid and lamina fusca, for these terminate in the vaginal processes, and can from that point act directly upon the lamina cribrosa.

I continued my researches for hypermetropic eyes with excavation, and succeeded in finding a second entire eye with an excavation even more marked than in the first case, as well as the posterior section of an eye with traces of the dragging above mentioned (although no distinct excavation was visible), together with incipient equatorial cataract with all the symptoms so excellently described and represented by Becker. The only variation consisted in groups of darker-colored cells and nuclei, shrivelled granules of normal size, enlarged cells, and, finally, globular cells without nuclei.

The epithelial nuclei of the central part of the anterior capsule of the first eye absorbed very little coloring matter, but in the second eye the same locality showed deeply tinted nuclei.

The equator shows the most marked alterations in all respects.

The zonula fibres (Fig. 7) separate distinctly behind the anterior ciliary processes into two columns, the thicker of which curves sharply around the ciliary body, and extends to the anterior capsule, whilst the posterior column, much the thinner of the two, passes from the same spot almost directly to the posterior capsule. Transverse sections show that the zonular space is triangular, the base formed by a bit of capsule 2 *mm* in extent in front of and behind the equator, whilst the sides are composed of the anterior and posterior zonular fibres, against which the hyaloid proper is closely applied. The insertions upon both anterior and posterior capsules keep almost precisely the same direction, so that the points into which the various zonular fibres expand like a small paint brush, lie in one line, and the insertion lines form upon the posterior capsule a circle which lies about 0.8 to 1 *mm* from the equator of the capsule. The anterior line of insertion lies somewhat nearer the equator than the posterior, and upon the posterior capsule the circle coincides with the epithelial border. The brush or glove-like terminations expand over the anterior and posterior capsules, and gradually melt into them. There is, additionally, a third and middle set of fibres which are rarer and not often visible in transverse sections, because they lie singly. But in surface-preparations of the capsule they are always visible. Their insertions follow the same direction as the others, and they unite close behind the equator, directly between the insertions of the other sets of fibres, but their method of insertion is entirely different, since they bore into the capsule like the roots of trees into the earth.

Fine fibres then extend from these roots out over the capsule, and gradually are lost in the latter. In the case of the equatorial fibres, the fibrils run both forward and backward, not like the others, which only run in one direction. The spaces between these three lines are entirely free from insertions.

Figs. 1 and 2 show a bit of capsule with the epithelium in front of and behind the equator. To the right lie the anterior, to the left the posterior zonular fibres, and in the middle, directly left of the equator, the middle fibres, which do not stand quite perpendicular to the capsule, but are bent a little backward.

The cells with deeply tinted nuclei upon the capsule of the first eye (Fig. 1) are grouped unmistakably around the foot of the middle zonular fibres.

The accummulation of intensely colored nuclei is most marked at two points, which correspond to the insertions of the anterior and middle zonular fibres.

If we now turn to the second eye we meet with the same alterations though in more advanced stages. Fig. 2 shows a bit of capsule at both sides of the equator. The form of the cells and nuclei is just the same as in the first case, only Wedl's globular cells are more abundant.

Fig. 3 represents a portion of a section from the anterior capsule where the anterior fibres are attached. We see in the midst of the epithelial cells, Wedl's globular cells, which originate from those epithelial cells which find no place between the rest of the cells along the capsule, and are therefore pressed toward the interior.

Fig. 5 represents a meridional section of the capsule of the first eye directly through the insertion of a middle zonular fibre, with a slight suggestion of fold-formation. The deeply tinted nuclei are heaped up close together at this point, whilst backward they quickly grow scanty, and a little way forward entirely disappear.

The space included in the line *a b* (Fig. 6) is generally lost in meridional sections, or becomes loose in its tissue. No matter however formed the anterior fissure—*a*—is generally empty, while the posterior—*b*—almost always contains a number of larger or smaller globular cells. And we are almost inclined to believe that they find their way here from the equator.

Becker refers the proliferation of the capsular epithelium and the development of the globular cells to cataractous and senile shrivelling of the lens. The shrivelling is primary, the proliferation secondary. The process begins with shrivelling of the nucleus and decrease in the tension of the capsule.

This arrangement of the proliferative processes will lead us in our cases to think that this is not atrophic proliferation, but that the dragging of the zonular fibres undeniably witnessed in the second eye in the appearance of folds, exercises upon the capsular epithelium an irritation which excites the latter into subdivision of cells, but is at first confined to the neighborhood of the foot of the fibres.

If we now combine our results, we find localized inflammatory proliferation of the capsular epithelium directly behind the *equator, corresponding to the insertion of the middle zonular fibres, and a similar proliferation corresponding to the insertion of the anterior zonular fibres, and at this point the lens has begun to participate in the process in the form of incipient cortical cataract.*

Since it is rarely possible to verify by autopsy the condition of an eye observed during life, we must compare investigations on the living with corresponding conditions in the dead.

The following incidental case was observed June 19th of this year, and confirms the conditions above mentioned:

Madame S., aged seventy-one; L. E., absolute amaurosis from glaucoma simplex; R. E., S. 20–25, with + 42. Both optic nerves deeply excavated; left nerve white, right redder. Tension not palpably increased. Lens and iris in normal situation, and in both eyes a broad iridectomy coloboma outward done two years before. No nuclear selerosis in either lens. Vitreous transparent. The coloboma permits the equator of the lens to be seen as represented in Fig. 4. A row of fine whitish-gray lines, about 1 *mm* in length and pointing toward the centre of the anterior surface, lies about 1 *mm* from the equator of the lens. An opacification on the posterior surface begins directly at the equator and forms a border about 0.75 to 1 *mm* wide, lying close to the posterior surface. The zonular fibres in their course from the ciliary body to the lens look precisely as in an anatomical preparation; we can even distinguish the separate fibres. Nevertheless with the naked eye we cannot discover any direct connection of the various fibres with the opacities upon the anterior surface.

This condition on the living challenges comparison with the anatomical preparations. The wreath corresponds to the region of the anterior zonular fibres, viz., of Fig. 2 and Fig. 6, and to the appertaining cross-section Fig. 3, the dark border behind the equator to the middle fibres *mz*, of Fig. 2 and Fig. 6, and to the transverse section Fig. 5.

Accommodative excavation was found in the two eyes examined anatomically, glaucoma simplex in the two living eyes. The equator of all four lenses exhibited symptoms identically alike. Accommodative over-exertion should be regarded as responsible for the whole list.

At the two points therefore where in the accommodative circle different structures are intercalated, viz., the optic nerve and lens, we meet in eyes whose accommodation is greatly over-exerted, alterations which can only be explained by a dragging on the accommodative fibres.

In times past, no one could see any but chemical causes for the origin of cataract, except in traumatic cases; but in the above conditions we recognize a purely mechanical cause.

It might further seem very desirable to show statistical columns of parallelism between exertion of accommodation and the occurrence of capsular and cortical cataract, but here the affair is of quite a different nature, because in a larger number of cases, owing to advancing age, there would be no surprise at finding incipient cataract.

Only large numbers could offer decisive proof; and besides that, the extreme equator of the lens should be accurately examined in all cases, something that cannot well be done in practice, and is quite impossible without dilatation of the pupil.

Explanation of Figures on Plate I.

$$\left.\begin{array}{l} vZ = \text{anterior} \\ mZ = \text{middle} \\ hZ = \text{posterior} \end{array}\right\}\text{ zonular fibres.}$$

eg = Epithelial border in the rear.
hp = Hyaloidea propria.
Aeq = Equator of capsule and lens.

$$\left.\begin{array}{l} v = \text{anterior} \\ h = \text{posterior} \end{array}\right\}\text{ surface of the lens.}$$

Fig. 1. Surface preparation of the capsule with the epithelium. Conglomeration of cells with deeply tinted nuclei around the middle zonular fibres. Globular cells at the second fibre. (Hart. Obj. 5, Oc. 2.)

Fig. 2, like Fig. 1. Folds at the foot of the middle zonular fibres. Numerous deeply tinted nuclei near the anterior insertions. Two globular cells on the third and fourth fibres. (Obj. 5, Oc. 2.)

Fig. 3. Meridional section in the region of the insertions of the anterior fibres. Globular cells (l = the lens ; e = epithelium ; k = capsule). (Obj. 7, Oc. 2.)

Fig. 4. Iridectomized eye, lateral illumination. Wreath-like opacities, in or under the anterior capsule, and opaque border behind the equator corresponding to the posterior capsule. The second contour shows the capsule slightly stripped off.

Fig. 5. Meridional section through the foot of a middle zonular fibre. Diffused epithelial border. Enlarged cells, and deeply tinted enlarged nuclei. In front (upward) the cells that had begun to subdivide cease for a little space, and backward (downward) they rapidly become scattered and few in number. (Obj. 7, Oc. 2, with pushed in tube.)

Fig. 6. Half schematic transverse section of a lens, which demonstrates the cellular proliferation, and conglomeration of globular cells at the insertions of the anterior zonular fibres, as well as the cellular proliferation corresponding to the insertions of the middle zonular fibres. The wavy hyaloidea propria is applied to the posterior zonular fibres, and then continues over the posterior surface ; *a* and *b* are the fissures which are often formed on making sections. Globular cells chiefly lie in the fissure *b*.

Fig. 7. Meridional section; exhibits the triangular space and the arrangement of the posterior and anterior zonular fibres in relation to the capsule and ciliary body ; accurately copied with aid of a photograph. (Obj. 5, Oc. 2.)

PATHOLOGICO-ANATOMICAL INVESTIGATIONS OF THE EYES OF DIABETIC PERSONS.

By Dr. V. KAMOCKI, of Warsaw, Russia.

Translated by Dr. H. A. B. MacCauley, of New York.

(*With two lithographic plates*, Tab. II. *and* III.)

NOTWITHSTANDING much attention has been paid of late years to diseases of the eye appearing during the course of diabetes, our knowledge of the pathologico-anatomical changes upon which these diseases are based is still very scanty. Even in the case of cataract, by far the most frequent complication of diabetes, we have only the results obtained by Prof. Becker, other investigations upon diabetic cataracts extracted without the capsule (Knapp) not being here considered. During my sojourn in Heidelberg, Prof. Becker was kind enough to give me the opportunity of examining four diabetic eyes from different individuals; two of these showed cataract and the other two were apparently normal. Although I can substantially only verify what is already known, the rarity of the material and the fact that I have brought out some new points lead me to hope that my contribution will not be unwelcome. Before instituting a general comparison of the results obtained, which in the main agree with each other, I append a brief statement of the details of each case.

Case 1.—January 19, 1884. Two eyes with diabetic cataract; male, sixteen years. Quantity of urine, 4,000–6,000 *ccm;* 8 % sugar. Death accompanied by intestinal catarrh. The eyes were taken out while warm and immersed in Müller's fluid. A horizontal section of the right eye was made June 2, 1886, and the upper half, after soaking in water for two days, was imbedded in celloidin, and then sliced with the microtome, stained with hæmatoxylin and hæmatoxylin-eosin, and treated with Canada balsam. Polar diameter of lens, 5.5 *mm*; equatorial diameter, 8.75 *mm*. The unusual thickness of this lens was due to a considerable accumulation of coagulated fluid within the capsule. The nucleus of the lens, considerably fissured and with loosened fibres, appeared as though suspended in this fluid. The vortex of the lens is well preserved in places only. The young fibres are considerably thickened, and numerous vesicle cells are the result of their metamorphosis. The fluid is found not only directly under the capsule, but penetrates through the fine crevices and larger spaces between the lamellæ to the centre of the segmented and relaxed lens nucleus, there coagulating in large drops, giving rise to the peculiar algæ-like appearance. There are, however, more interesting changes in the iris, especially in its posterior pigmentary layer (Fig. 1), which is excessively swollen and softened. Besides this thickening, a peculiar light appearance of the pigmentary layer is remarked. The cells are arranged here and there in layers, are transparent, and distended like a balloon. The pigment, present in very small quantity, is seen rolled up into a ball and crowded with the nucleus over against the cell wall; otherwise the cell seems quite empty. In some places cells have burst and joined with others to form peculiar cystic spaces (Fig. 1, *a*) of remarkable dimensions, which are visible macroscopically, being 1.5 *mm* in width by 0.08 *mm* in height. The outer wall of these cysts consists of coherent cell membranes with shreds of pigment and cell membranes attached to it. The edge of the cornea shows a slight subepithelial inflammatory infiltration, otherwise it is quite normal. The pial sheath of the extrabulbar part of the optic nerve is also somewhat infiltrated.

Case 2.—Mrs. H., forty-three years, bilateral diabetic cataract. Right, linear extraction in November, rapid cicatrization without reaction. Died of pulmonary phthisis January 21, 1884. Urine contained a large quantity of sugar. The left eye was removed nine hours after death and immersed in Müller's fluid. A year later the eye was prepared for examination in the usual manner. Lens fairly normal.

The above-mentioned changes in the iris were also seen in this case, although the pigmentary layer is not so much relaxed. The picture seen is more delicate and may be aptly compared to a sample of fine lace (Fig. 5). The epithelium is in two layers, the posterior and more superficial of which is composed of high slim cylindrical cells with clear water-like contents. Fine pigment granules lie upon the cell membrane and the nuclei stained a beautiful blue with hæmatoxylin are distinctly seen. The rarefaction of the pigment in this case gives opportunity for a more exact consideration of the existing conditions of the posterior epithelium of the iris, and yields conclusive evidence of the presence of its two layers. This is best shown on the border of the pupil, where one of the layers is reflected upon the other (Fig. 4). The gradual transition of the posterior layer of the iris into the pars ciliaris retinæ is also quite evident, as is the evolution of the anterior layer into the pigment epithelium of the ciliary body. A certain amount of importance attaches to this statement, as it gives a new proof of the correctness of Schwalbe's[1] conclusion (confirmed by Hirschberg,[2] Koganeï,[3] Boé[4] and Fuchs[5]) that the pigmentary layers of the posterior surface of the iris correspond to the two layers of the secondary ocular vesicle. The condition of the remaining membranes of the eye was quite normal. Cystic formations in those parts of the retina bordering on the ora serrata are frequently seen in the senile eye and will be considered at the end of this article. The rest of the retina is well preserved.

CASE 3.—Diabetes mellitus. Louise S., forty-two years, died in the Heidelberg Clinic April 21, 1883. Quantity of urine 6,000–10,000 *ccm;* 4–5 % sugar. Enucleation one hour after death, and one eye immersed in Müller's fluid, while the other was subjected to a chemical examination by Dr. Mays. The chemical examination demonstrated with certainty the presence of a considerable amount of sugar in the vitreous with slight traces in the cornea. None was found in the lens or aqueous humor. The other eye was prepared for microscopical examination June 5, 1886. The dimensions were normal. The iris was much thinner than in the preceding cases, but shows undoubtedly the same appearances (Fig. 3). The epithelium is disposed in two layers, the posterior of cylindrical cells of moderate height which show unmistakable rarefaction of the pigment and swelling of the cells. The nuclei which are barely visible normally are distinctly seen colored with hæmatoxylin, the contents of the cell however remaining colorless as before. The cells of the anterior layer are quite flat, almost like endothelium, are likewise swollen and show a tendency to breaking down, thus causing a lifting up of the posterior layer in places, it remaining adherent to the capsule of the lens. Upon examination of the optic nerve something new was found in the shape of a considerable colloid mass situated in the papillar tissue inside of the lamina cribrosa, composed of small round bodies with a slight indication of concentric lamellæ. The neighboring nerve tissue seemed simply pushed apart without participating in the morbid process.

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[1] Lehrbuch der Anatomie der Sinnesorgane. Erlangen, 1883, S. 200.

[2] Ein Fall von Aderhautgeschwulst nebst anatomischen Bemerkungen. *Arch. f. Opthalm.*, Bd. xxii., Abth. i., S. 146.

[3] Untersuchung über den Bau der Iris des Menschen und der Wirbelthiere. *Arch. f. mikrosc. Anat.*, Bd. xxv., Heft i.

[4] Quelques recherches sur la couche pigmentaire de l'iris. *Arch. d'opth.*, Juillet-Août, 1885.

[5] Beiträge zur normalen Anatomie d. menschlichen Iris. *Arch. f. Opth.*, Bd. xxxi, Abth. iii., S. 71.

Upon the surface of the above structure were seen occasional spindle-shaped nuclei, but no continuous cellular investment. I also found quite similar bodies in the arachnoidal sheath at the place of entrance of the optic nerve. These showed delicate concentric lamellæ and a distinct cuticle of endothelial cells.

Masses resembling these were first noticed by H. Müller in an atrophied optic nerve, and they have been frequently seen in other morbid conditions. Iwanoff has demonstrated their presence in eyes of normal visual power (*l. c.*), and regards them as colloid deposits from the vitreous membrane of the choroid, which have penetrated into the optic nerve. The granules found in the arachnoid I believe to be of endothelial origin, analogous to the so-called "brain sand." To return to the eye in question, I also found an extensive cystic formation, not only in the extreme periphery of the retina, but also in the region of the equator. Moreover, at a circumscribed point in this region, the retina was adherent to the choroid with degeneration and pigment infiltration.

CASE 4.—Enucleation of the diabetic eye one hour after death, by Dr. Da Gama Pinto. Anna S., 31 years; died June 2, 1883, in Heidelberg Clinic, of diabetic coma, cheesy broncho-pneumonia, acute catarrh of both apices of lung, pulmonary and glottis œdema, pneumonia at base of both lungs. According to patient's statement, disease began five weeks before. Quantity of urine, 2,600–3,400 *ccm;* specific gravity, 1.028–1.033; sugar, 4.5–5.3 %. The other eye, according to the chemical analysis of Prof. Kühne, showed 1 *mgrm* of sugar in the vitreous, 0.07–0.2 in the aqueous, with probably a small quantity in the lens (0.2–0.4 *mgrm*), while its presence in the cornea was very doubtful. The microscope in this case gave decidedly negative results, excepting œdema of the extreme periphery of the retina manifesting itself in cystic formations. The remaining retinal structure was without pathological alteration.

To recapitulate briefly the changes found in the lens in the first three cases, we note the following: Commencing proliferation of the intracapsular cells, formation of vesicle cells, and finally, absorption of water by the lens nucleus with resulting loosening of its fibres, drops of water forming in the spaces made by this separation of the fibres. I think I recognize in the above phenomena three successive phases in the formation of cataract (although detailed notes as to the condition of the clouded lenses during life are not at my command).

The lens in Case 3 was transparent during life, although there was evidence of the beginning proliferation of the intracapsular cells, but this can hardly be looked upon as an objection to the above view. Knies[1] and Becker (*l. c.*, Seite 137) have demonstrated that lenses which were quite clear during life may give signs of extensive intracapsular cell proliferation (capsular cataract) when examined with the microscope after death.

Moreover, in our special case, the extent of the process was so slight, and its location so extremely peripheral, that it hardly would have been recognized as an opacity of the lens, even with maximum dilatation of the pupil. The condition of the lens in the second case (formation of vesicle cells), in the region of the equator, represents the stage of beginning cloudiness, and corresponds perfectly to Prof. Becker's clinical demonstration of the process (*l. c.*, S. 164). Becker thinks, and is supported in this view by Foerster, that the diabetic cataract first begins with opacity of the outer cortical layers, immediately under the capsule in the region of the equator, the deeper layers, as well as the nucleus, remaining entirely clear.

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[1] *Zehender's klin. Monatsbl.*, 1880, Band xviii., S. 181.

By the arrangement of the straighter of the vesicular cells and their cone-like accumulation, the above condition of the diabetic opacity of the lens, as well as the primary sector-like separation of the lens surface, may readily be explained.

Finally, as far as my first case is concerned, my observations agree perfectly with those of Becker (*l. c.*, S. 157 u. ff.), so much so that he describes almost word for word the appearances found by me, except that there was more accumulation of fluid within the capsule in my case, causing greater distension of the lens. It is very remarkable that such extensive œdema should exist in a disease presenting so many conditions favorable to the withdrawal of water. The cause of this is probably to be found in the softening and swelling of the capsule, based upon disturbances of nutrition, thus permitting of an abnormal degree of diffusibility (vergl. O. Becker).

The chemical examination of the media of the eye is of considerable importance, according to Becker's statistics (*l. c.*, Seite 165) of thirty-one cases, in which he found positive evidences of sugar in the cataract in twenty-two cases, while two were doubtful. He however calls attention to the fact that it is hardly ever found in the lens unless the urine is highly saccharine, and that consequently there are considerable variations in the quantity of sugar present. As far as unclouded lenses are concerned, Deutschmann (*l. c.*, Seite 143), in a ten-year-old diabetic child, found 0.5 per cent. of sugar in the aqueous humor, 0.366 per cent. in the vitreous, but none in the lens. In one of the cases presented above, Dr. Mays found positive evidence of sugar in the vitreous only, while in the other, analyzed by Prof.

Kühne, the lens and aqueous humor also contained small quantities of sugar. The hypothesis that the formation of cataract in diabetic eyes is a result or partial symptom of general disease of the eye, is substantially supported by the peculiar appearance of the retinal pigment leaf of the iris. This has already been observed and discussed in detail by Becker (*l. c.*, Seite 157 u. 171). It is not easy to formulate an opinion as to the nature of these changes. This much may, however, be said: We have to do with two different processes, an active one with increase of the cells of the posterior layer, and a degenerative one with cell-metamorphosis. The cells, in spite of their resemblance to degenerated goblet cells, appeared to be empty, and were probably filled during life with a clear water-like liquid. They seemed to be hydropic cells, such as are observed in the subcutaneous tissue of the emaciated and œdematous cadaver. Upon inspection of the lithographic plates of the pigmentary layer of three of the eyes, to which the fourth, although unchanged, is added for the sake of comparison, the different stages of this metamorphosis are quite evident, reaching their culminating point in the first case. The implication of the pigmentary layer alone, without changes in the remaining structure of the iris, is very remarkable, and we are not able at present to explain the import of this enigmatical process. The results obtained are nevertheless fraught with importance as furnishing, perhaps, anatomical reasons for many of the variations in the course of diabetic cataract. Leber,[1] for instance, has called attention to the frequent occurrence of severe forms of retinitis complicating cataract in the course of diabetes. Also the fact that four of five of the thereupon examined cases (including Becker's) showed the same changes, is in favor of such an interpretation, and further support is given by the clinical observations of competent specialists. Becker, in his first great monograph, which appeared as a part of the Gräfe-Sämisch handbook, mentions the fact that in swollen diabetic cataract the borders of the pupil, as well as the limbs of the coloboma, after preparatory iridectomy, appear very wide. Snellen[1] remarks that the pigment of the iris seems often very loose, as in the macerated bulbus. One of Hirschberg's[2] recent communications seems to me to be so important that I take the liberty of quoting it. The case in question was a woman, fifty-four years; quantity of urine, 2,500 *ccm* of s. g. 1,044, containing 7.8 per cent. sugar. "May 15th., R., preparatory iridectomy above. Operation quite normal, the patient remaining very quiet; total absence of posterior synechiæ. The whole uveal layer of the iris remained in the coloboma. A small opening was noticed in the uveal layer. In hundreds of iridectomies, I have only seen this happen once before, in the case of an anæmic girl with cortical cataract. Uninterrupted cicatrization." And farther on: "May 20, 1884, L., preparatory iridectomy above. The whole uveal layer remained caught in the coloboma. This time I removed it with the forceps. Uninterrupted cicatrization. The cataract was somewhat swollen, with long, broad cortical stripes, but was far from being ripe."

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[1] Ueber das Vorkommen von Iritis und Iridochoroiditis bei Diabetes mellitus, etc. *V. Grafe's Archiv*, Bd. xxxi., Abth. iv., S. 183 u. ff. Vergl-ebenfalls F. Wiesinger: Ueber das Vorkommen von Entzündung der Iris und Cornea bei Diabetes mellitus. S. 203 u. ff.

Lately, Hirschberg reports a new case of diabetic cataract, where, upon the performance of preparatory iridectomy, large shreds of the uveal tract were torn away, and the aqueous humor looked like ink (*Centralbl. f. prakt. Augenheilk.*, Julyheft, 1886, S. 196).

The peculiar condition of the iris described in the preceding pages, explains this fully, I think, and renders further comment upon the observations cited unnecessary. In conclusion I would say that I have given special attention to three cases lately described by Fuchs,[3] in which he mentions fissure-like spaces ending by crypt-like openings upon the anterior surface of the iris (Fig. 1, *b*). Fuchs believes these to be lymph spaces, but the result of my own observation does not confirm this. The extensive cystic formation in that part of the retina bordering upon the ora serrata, observed in the last three of my cases, is worthy of more exact consideration. Iwanoff,[1] as is well known, has tried to establish a connection between this apparently harmless affection and the formation of cataract, after verifying its existence in sixteen out of eighteen cases of ordinary senile cataract. Henle, however, has found it so often present that he believes it to be normal. Iwanoff thinks it the manifestation of chronic retinal œdema, while Landsberg,[2] on the other hand, finds the cause of the cystic formation in a peculiar degeneration of the outer granular layer of the retina. I regard Iwanoff's views as most plausible, and think the appearance of that part affected with cystic formation is more due to pressure than to real degeneration processes. The results of my investigations are the more interesting from the fact that only one of my relatively young subjects was affected with cataract, while according to Iwanoff's extensive researches the changes found are peculiar to the later periods of life.

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[1] Vergl. O. Becker: Zur Anatomie der gesunden und kranken Linse. S. 171.

[2] *Centralbl. f. prakt. Augenheilk.*, Juniheft, 1884, S. 187.

[3] *Archiv f. Ophthalm.*, Bd. xxxi., Abth. iii., S. 59.

EXPLANATION OF PLATES II. AND III.

FIG. 1. Horizontal meridional section of eye of sixteen-year-old diabetic girl (Case 1). Hartnack Syst. II., Oc. 2. Penetration of water within the lens capsule ; fibre separation ; formation of vesicle cells ; algæ-like figures. In the retina at *a*, cystic formation in the pigmentary layer ; at *b*, lymph spaces of Fuchs' opening upon the anterior surface of the iris.

FIG. 2. Iris of diabetic individual (Case 4) thirty-one years old. Pigment of the iris at *a* is normal ; *b* = posterior limiting layer of iris (Fuchs) ; *c* = stroma of the iris. Zeiss' system, C, Oc. 3.

FIG. 3. Iris of a diabetic woman forty-two years old (Case 3). At *a* the posterior lamella of the pigmentary layer, composed of cylindrical cells which have become much lighter ; *b* = the low partly broken-down cells of the anterior layer ; *c* = posterior limiting layer ; *d* = iris stroma.

FIG. 4. Pupillar edge of the iris in Case 2. The reflection of

the pigmentary layers, one upon the other, is very distinct. Cells of posterior layer (*a*) are high and cylindrical ; those of the anterior, cubical ; *c* = sphincter of iris ; *d* = cells containing pigment, Koganeï. Zeiss' system C, Oc. 3.

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[1] Beiträge zür normalen und pathologischen Anatomie des Anges. *Archiv für Ophthalm.*, Bd. xv., Abth. ii., S. 90.

[2] Ueber cystoide Degeneration der äusseren Körnerschicten. *Arch. f. Ophthalm.*, Bd. xxiii., Abth i., S. 203.

FIG. 5. A more peripheral portion of same iris. *a* = cells of posterior pigmentary layer ; *b* = broken-down cells of anterior layer ; *c* = posterior limiting layer of iris ; *d* = iris stroma. Zeiss' system C, Oc. 3.

FIG. 6. A part of Fig. 1, with Zeiss' system C, Oc. 3. *b* = the pigmentary layer of the iris very much loosened, appearing in several layers with clear, vesicular, balloon-like cells ; the nuclei are here and there visible, in other places obscured by pigment ; *a* = sphincter of the iris.

REPORT ON THE FIRST SERIES OF ONE HUNDRED SUCCESSIVE EXTRACTIONS OF CATARACT, WITHOUT IRIDECTOMY.

By H. KNAPP, M.D.

THE series of cataract extractions considered in the following report were performed in New York City, the great majority at the Ophthalmic and Aural Institute, from June 10, 1886, to November 13, 1887. During this interval of time I made 117 extractions of cataract, among which 17 with iridectomy, according to von Gräfe's method. The necessity or advisability of the iridectomy was recognized either before or during the operation. The cases in which a subsequent excision of the iris was made for prolapse or glaucoma (1 case) are comprised in the present series. It results from these figures that I made an iridectomy in $\frac{1}{7}$ or 15 % of the cases. On February 21, 1887, I read a paper on cataract extraction without iridectomy before the Ophthalmological Section of the New York Academy of Medicine, which was based on the 29 first cases of the series under consideration. As this paper was published in these ARCHIVES, March, 1887, (vol. xvi., p. 54, etc.,) I can refer to it and begin this report with a tabular synopsis of the remaining 71 cases, but I first beg leave to supplement the above publication by a statement of the further changes that have come to my notice concerning the first 29 cases. I have endeavored to obtain as complete records as possible, not only during the time the patients were under my daily care at the hospital, but also later, asking them to come to me and be examined again, or to send me letters either personally or through their physicians; and I have written to those of whom I had notes only on the primary visual results. We all know, however, that, in spite of every effort, such reports must remain more or less incomplete; yet with all their shortcomings they draw the most trustworthy picture of our work, bringing out, in the number and kind of accidents, our lack of experience and skill, while the results demonstrate the correctness or fallacy of the principles and rules that guided our minds and hands.

Case 7 had V $\frac{20}{200}$ at time of discharge, 12 days after extraction; discission 5 weeks later gave in 4 days V = $\frac{20}{70}$, in 8 months V = $\frac{20}{20}$.

Case 8. Primary V = $\frac{20}{100}$, in 8 months = $\frac{20}{40}$, in 10 months = $\frac{20}{50}$; disc. advised.

Case 11. Prim. V = $\frac{20}{100}$, with large prolapse, which in 6 months had spontaneously and completely disappeared; V = $\frac{20}{70}$.

Case 16. Prim. V = $\frac{20}{50}$; disc. in 6 months, V = $\frac{20}{20}$.

Case 17. Prim. V = $\frac{2}{200}$, later $\frac{10}{200}$; in 3 months, $\frac{20}{200}$.

Case 18. Prim. V = $\frac{8}{200}$; disc. 8 months later, V = $\frac{15}{200}$. Old corneal opacities prevent better vision.

Case 21. Prim. V = $\frac{10}{200}$, in 10 weeks = $\frac{20}{40}$, in 6 months = $\frac{20}{20}$.

Case 23. Prim. V = $\frac{20}{100}$, in a year $\frac{20}{70}$.

Case 24. Prim. V = $\frac{10}{200}$; disc. in 4 months, V = $\frac{20}{40}$.

Case 25. Prim. V = $\frac{20}{70}$; disc. in 3 months, V = $\frac{20}{30}$.

Case 26. Prim. V = $\frac{20}{70}$; in 4 weeks = $\frac{20}{40}$; in a year = $\frac{20}{50}$; disc., V = $\frac{20}{20}$.

Case 29. Prim. V = $\frac{20}{70}$; disc. in 2 months, V = $\frac{20}{20}$.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
30	Mrs. M. Fleck. 49. Good.	Almost mature. Normal.	March 3, 1887. Conjunctival flap. During capsulotomy lens and some *vitreous* expelled by sudden contraction of lids. Iris reduced. Wound closed slowly, *Iris folded back.* 35 days.	$\frac{20}{100}$.
31	Mrs. Cors. 60. Good.	Hard, ripe. Normal.	March 23. Conjunctival flap. 15 days.	$\frac{20}{70}$.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
32	Mrs. Bache. 27. Good.	Soft. Normal.	March 24th. Speculum removed after division of capsule. Lens expelled by pressure with lids. 20 days.	$\frac{20}{70}$. Discission on 14th day. $\frac{20}{20}$.
33	Mr. Gallagher. 66. Good.	Hard, ripe. Normal.	March 24th. Small conjunctival flap. 14 days.	$\frac{20}{70}$.
34	Mrs. Townsend. 54. Good.	Morgagnian. Normal.	April 4th. No injection into ant. chamber. 13 days.	$\frac{20}{70}$. Disc. 23d day. $\frac{20}{30}$; $\frac{20}{20}$ in 9 mos.
35	Mr. Stanton. 56. Good.	Hard, ripe. Normal.	April 4th. Pupil oval, by iris, partly *tiltea back.* 20 days.	$\frac{20}{200}$.
36	Jas. Christian. 67. Good.	Hard, ripe. Normal.	April 11th. 16 days.	$\frac{20}{70}$. Disc on 17th day. $\frac{20}{30}$.
37	Charles Mills. 67. Good.	Hard, ripe. Normal.	April 13th. Large conjunctival flap. 17 days.	$\frac{20}{30}$.
38	Mrs. Coulter. 67. Good.	Almost mature. Normal.	April 13th. 19 days. Pupil oblong; iris *adherent* to scar.	$\frac{20}{100}$. Disc in 11 months. $\frac{20}{100}$ in 3 weeks.
39	Mr. Butler. 66. Colored, good.	Hard, ripe. Normal.	April 14th. Conjunctival flap. Horizontal superior division of capsule. 15 days.	$\frac{20}{100}$. Capsule evenly stretched across pupil. 9 months, capsule wrinkled, $\frac{20}{200}$. [Disc. necessary.]
40	Cath. Gill. 55. Good.	Hard, ripe. Normal.	April 16th. 16 days.	$\frac{20}{200}$. Disc in 9 mos. $\frac{20}{30}$.
41	Mr. Stewart. 59. Bright's disease; alcoholism.	Hard, ripe. Normal.	April 16th. 14 days. Pupil round; no adhesions.	$\frac{20}{70}$. 9 weeks after ext. crucial division, followed by *acute glaucoma.* Iridect. 2 days later. Rapid recovery. $V = \frac{20}{50}$. Died 2 months later.
42	Mrs. Donovan. 68. Good.	Hard, ripe, complicated. Normal.	April 23d. Some *irido-capsulitis;* subsiding in 3d week. 29 days.	$\frac{20}{200}$. Old trachoma and maculæ corneæ.
43	James Couser. 75. Good.	Hard, ripe. Normal.	April 23d. Conjunctival flap. 18 days.	$\frac{20}{70}$.
44	Mrs. King. 51. Good.	Hard, ripe. Normal.	April 23d. 23 days.	$\frac{20}{30}$.
45	Mr. Thoma. 67. Good.	Hard, ripe. Normal.	April 23d. 15 days.	$\frac{20}{50}$; in 2 months $\frac{20}{200}$. Discission $\frac{20}{40}$.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
46	Mrs. Laverack. 74. Good.	Hypermature. Normal.	May 4th. Conjunctival flap. Expulsion of lens laborious. *Intense iritis with closure of pupil.* 19 days.	$\frac{1}{\infty}$. In 5 months $\frac{4}{200}$. Discission, $\frac{20}{50}$.
47	Mr. Vinton. 52. Good.	R.—Hard, ripe. Normal.	May 4th. 13 days.	$\frac{20}{50}$. Discission, $\frac{20}{20}$.
48	Mr. Vinton. 52. Good.	L.—Hard, ripe. Normal.	May 17th. 13 days.	$\frac{20}{50}$. Discission, $\frac{20}{20}$.
49	Pet. Bowman. 56. Good.	Hard, ripe. Normal.	May 7th. 14 days.	$\frac{20}{200}$.
50	Mrs. Graddy. 60. Good.	Morgagnian. Normal.	May 11th. Lens removed with capsule. Iris reduced. No injection into chamber. 19 days.	Fundus perfectly clear. Pupil round. V. excellent, $\frac{20}{20}$ (estimated, patient cannot read).
51	Mr. Bietz. 65. Good.	Hard, ripe. Normal.	May 11th. 15 days.	$\frac{20}{200}$. Discission, in 5 days $\frac{20}{200}$; in eight months $\frac{20}{30}$.
52	Mr. L. Kahn. 66. Good.	Hard, ripe. Normal.	May 13th. 16 days.	$\frac{20}{200}$. Disc. in 5th week; $\frac{20}{200}$ 7 days later; $\frac{20}{30}$ 9 months later.
53	Mr. Suydam. 84. Feeble.	Hypermature.	May 12th. 21 days.	$\frac{20}{200}$. Discission, $\frac{20}{50}$.
54	Mrs. M. Beyer. 54. Good.	Hard, ripe. Iris atrophic.	May 17th. Pupil oblong; iris *adherent* to scar.	$\frac{20}{200}$
55	Mrs. Kean. 76. Good.	Hard, ripe. Normal.	May 20th. Two filiform *adhesions.* 20 days.	$\frac{20}{200}$. Disc. on 30th day; $\frac{20}{70}$ 5 days later.
56	Mrs. Ehrlich. 77. Bronchitis.	Hard, ripe. Normal.	May 19th. Some filiform *adhesions* and opacities in pupil. 25 days.	$\frac{20}{200}$. Disc. on 25th day. $\frac{20}{70}$; 8 days later.
57	Miss A. Knoop. 60. Asthma. Severe spells of coughing.	R. — Hypermature. Normal.	May 24th. 13 days.	$\frac{20}{200}$. Disc. on 34th day, $\frac{20}{50}$; $\frac{20}{30}$ in 7 months.
58	Miss A. Knoop. 60. Asthma. Severe spells of coughing.	L.—Hard, ripe. Normal.	Oct. 12th. No reaction. 16 days.	$\frac{20}{50}$. Disc. 2 months; $\frac{20}{30}$ in 2 months.
59	Mrs. Hand. 60. Good.	Hard, ripe. Normal.	May 25th. *Mild iritis,* with synechiæ below and some opacity of capsule. 20 days.	$\frac{20}{100}$. Disc. on 20th day; $\frac{20}{70}$ 5 days later.
60	Mrs. A. Simon. 42. Good.	Half-hard. Normal.	May 27th. 13 days.	$\frac{20}{50}$. Disc. on 13th day; $\frac{20}{30}$ 4 days later; $\frac{20}{20}$ a month later.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
61	Mrs. H. Lindsay. 65. Good.	Hard, ripe. Normal. Myopia.	May 31st. Circumcorneal injection. No synechiæ. 17 days.	$\frac{20}{200}$. Disc. on 18th day, $\frac{20}{100}$.
62	Mr. Mathews. 60. Good.	Hard, ripe. Normal.	June 6th. Two filiform *adhesions*. 13 days.	$\frac{20}{70}$.
63	Mrs. Parks. 61. Good.	Hard, ripe. Normal.	June 7th. Some pericorneal injection. 17 days.	$\frac{20}{100}$. Disc. on 21st day; $\frac{20}{40}$ 9 days later; $\frac{20}{20}$ 6 months later.
64	Mrs. Weid. 60 Good.	Ripe. Normal.	June 14th. 16 days.	$\frac{20}{70}$.
65	Dr. Orendorf. 56. Good.	Ripe. Normal.	June 14th. 15 days.	$\frac{20}{50}$. Disc. on 16th day; $\frac{20}{30}$ a week later.
66	Mr. Murphy. 45. Good.	Ripe. Normal.	June 21st. One filiform *adhesion*. 11 days.	$\frac{20}{50}$. Disc. on 21st day, $\frac{20}{30}$.
67	Mrs. Johnson. 65. Good. Traces of albumen in urine.	Ripe. Normal.	June 21st. Ruptured wound on sixth day by hurting her eye. Small *prolapse* in centre of section, which I *reduced*. Pupil central again. No reaction.	$\frac{20}{200}$. Disc. on 20th day; $\frac{20}{100}$ in 5 days; $\frac{20}{30}$ later.
68	Mrs. Hearn. 60. Good.	Ripe. Normal.	June 23d. 14 days.	Disc. $\frac{20}{200}$. Disc. on 14th day; $\frac{20}{70}$ 5 days later.
69	Mr. Vetter. 45. Good.	Ripe. Normal.	June 23d. Great difficulty in clearing pupil. Rubbing and Daviel's spoon. 14 days.	$\frac{20}{70}$. Disc. on 21st day; $\frac{20}{30}$ three months later.
70	Cath. Leydinger. 46. Normal.	Ripe, complicated. Normal.	Sept. 9th. Patient very refractory. *Fluid vitreous* escaped. Patient etherized to reduce iris. No irritation in healing, but *moderately large prolapse* of iris. 24 days.	$\frac{20}{100}$.
71	McCrystal. 50. Good.	Ripe. Normal.	Sept. 14th. Small peripheral part of *iris fell before knife;* excised. Pupil central, round. 19 days.	$\frac{20}{200}$. Disc. in 6th week; $\frac{20}{50}$ in 2 weeks; $\frac{20}{20}$ in 3 months.
72	Aaron Weise. 50. Good.	Ripe, complicated with glauc. simpl. Normal.	Sept. 19th. Patient restless. Small *prolapse*. Post. *synechiæ*. O. d. white; beginning of cupping. 17 days.	$\frac{15}{200}$. 4 months later: Incarceration of iris; no irritation; both Odd. whitish, somewhat cupped. $\frac{15}{200}$. Disc. in 5 months; S. $\frac{20}{100}$ in 4 days; 4½ months, $\frac{20}{70}$.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
73	Fr. Fischer. 46. Good.	Ripe. Normal.	Sept. 19th. 13 days.	$\frac{20}{70}$. Capsule veils fundus. Disc. in 4½ months; $\frac{20}{40}$ in 3 days; $\frac{20}{20}$ in 26 days.
74	Mrs. Fitzgerald. 62. Good.	Ripe. Normal.	Sept. 23d. 12 days.	$\frac{20}{70}$. $\frac{20}{40}$ in a month.
75	Mrs. Low. 62. Good.	Ripe. Normal.	Sept. 26th. Considerable cortex left. No reaction. Pupil round. 16 days.	$\frac{20}{200}$. Disc. on 33d day. $\frac{20}{70}$ in 5 days.
76	Mrs. Goldsmith. 69. Good.	Ripe. Normal.	Sept. 30th. Operation and healing of eye undisturbed. On 3d day, headache, nausea, and persistent, uncontrollable vomiting for 3 days (had such attacks before), then coma and *death*.	Condition of eye unexcelled. ($\frac{20}{40}$, estimated.)
77	Mrs. Stinitzka. 60. Good.	Ripe. Normal.	Oct. 1st. Pupil vertically oval. *Adherent to scar.* 14 days.	$\frac{20}{200}$. Disc. in 6th week; $\frac{20}{50}$ in 5 days; $\frac{20}{30}$ in 3 months.
78	Mr. Moore. 47. Good.	R.—Immature. Cortex transparent. V = $\frac{6}{200}$.	Oct. 4th. Lens and cortex escaped together completely. 14 days.	$\frac{20}{70}$. Disc. 2 months, V $\frac{20}{20}$.
79	Mrs. Devlin. 63. Good.	Complicated excessive myopia.	Oct. 5th. Hurt herself on changing dressing. Pupil oblong. (Adhesion of iris.)	$\frac{10}{200}$. Disc. 18th day; $\frac{20}{200}$ in 4 days.
80	Miss Geering. 22. Good.	Soft, ripe. Normal.	Oct. 6th. Patient restless. *Moderate prolapse.* No reaction. 16 days.	$\frac{20}{100}$. Prolapse cu. 21st day. Disc. 35th day, $\frac{20}{30}$.
81	Mrs. Murphy. 73. Feeble.	Complicated. Normal.	Oct. 6th. Extensive subconjunctival hemorrhage. No reaction. 20 days.	$\frac{10}{200}$. Atrophy of chor. in region of yellow spot. Died soon.
82	Mrs. Smith. 60. Good.	Ripe. Normal.	Oct. 7th. No reaction. 15 days.	$\frac{20}{200}$. $\frac{20}{100}$ in 5 weeks.
83	Ella Stein. 13. Good.	Ripe. Normal.	Oct. 10th. Capsule extracted with Mathieu's forceps. 12 days.	$\frac{20}{40}$.
84	Mrs. Cors. 60. Good.	L.—Ripe. Normal.	Oct. 12th. *Small prolapse.* 15 days.	$\frac{20}{100}$. Prolapse cystoid; abscised 2 mos. later. No reaction. V good, $\frac{20}{50}$ (estimated).

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
85	Mrs. Bradley. 75. Good.	Hypermature. Normal.	Oct. 14th. Capsule and lens removed with Mathieu's forceps. Pupil round. Pat. restless. *Prolapse* of iris. 21 days.	$\frac{20}{200}$.
86	Mrs. Crait. 56. Good.	Ripe. Normal.	Oct. 15th. 14 days.	$\frac{20}{50}$. 3 weeks.
87	Dr. Cr. 63. Good. Diabetes.	Hypermature. Normal.	Oct. 14th. Thickened portion of capsule removed with Mathieu's forceps. A good deal of manipulation in clearing the pupil thoroughly and reducing the iris. Thorough washing out of ant. ch. Intense pain first night. No discomfort afterward. Pupil round, central, clear. 20 days.	$\frac{20}{50}$ in 20 days; $\frac{20}{20}$ +, 6 weeks; the same in 4½ months.
88	Mrs. Schurich. 70. Feeble.	Morgagnian, complicated. Normal.	Oct. 18th. 14 days.	$\frac{20}{100}$. With + 7. Large crescent; rarefaction of choroid.
89	Mr. Eno. 67. Good.	Ripe. Normal.	Oct. 28th. 15 days.	$\frac{20}{70}$. Disc. on 30th day, $\frac{20}{20}$.
90	Mrs. McQuiry. 47. Good.	Ripe. Normal.	Oct. 28th. Pupil central. Iris *adherent* at periphery. 16 days.	$\frac{20}{100}$. Disc. in 4 mos.; $\frac{20}{50}$ in 3 mos. $\frac{20}{30}$ in 5 days.
91	Mr. Schuman. 66. Diabetes (5 % of sugar).	L.—Ripe. Normal.	Oct. 29th. *Incarceration* of iris, pupil oblong. No reaction. 20 days.	$\frac{12}{200}$. Disc. on 33d day; $\frac{20}{200}$ 6 days later.
92	Mrs. Morgan. 80. Feeble.	Ripe. Normal.	Nov. 3d. No reaction. Pupil slightly oblong; iris *adherent.* 14 days.	$\frac{20}{50}$. Disc. in 4 mos.; V = $\frac{20}{20}$.
93	Mrs. Laverack. 75. Good.	R.—Ripe. Normal.	Nov. 3d. Some synechiæ above and below. 14 days.	$\frac{20}{200}$. Disc. in 20 days; $\frac{20}{40}$ 6 days later.
94	Miss Jones. 29. Good.	Soft. Normal.	Nov. 4th. 9 days.	$\frac{20}{200}$. Disc. on 40th day; $\frac{20}{40}$ 4 days later; $\frac{20}{20}$ 3 mos. later
95	Mrs. Kirman. 82. Paralysis agitans.	Hard, ripe. Normal.	Nov. 6th. 15 days.	$\frac{20}{70}$.

No.	Name, Age, General Health.	Character of Cataract, Functional Examination.	Operation, Incidents, Healing Process, Duration of Treatment, Secondary Operation.	Primary and Ultimate Vision. Remarks.
96	Mrs. Barnett. 74. Good.	Cataracta nigra complicata. Normal.	Nov. 7th. Escape of a drop of *vitreous*. Iris *tilted* back. No subsequent protrusion. Healing undisturbed. 14 days.	$\frac{15}{200}$ on 14th day; in 3 months $\frac{20}{50}$. Atrophy of choroid. Pupil oblong. Synechiæ in upper part.
97	Mrs. McCowan. 59. Good.	Ripe. Normal.	Nov. 8th. 14 days.	$\frac{20}{100}$. Disciss. 56th day; $\frac{20}{50}$ 5 days later. Exposed herself at home. Pain and diffuse opacity of vitreous. Recovered quickly by leeches, salicyl. of soda. $V = \frac{20}{40}$.
98	Mr. Vail. 70. Diabetes.	Morgagnian. Normal.	Nov. 9th. Parotitis on 9th day, lasting 3 days, not interfering with undisturbed recovery of eye. 18 days.	$\frac{20}{200}$. Disc. on 14th day; $\frac{20}{200}$ 4 days later; $\frac{20}{40}$ 3 weeks later.
99	Mr. Volckmer. 64. Good.	Ripe. Normal.	Nov. 12th. Pain in first night, swelling of lids. Spongy exudation and some lens matter in ant. chamber; both absorbed slowly. No discomfort from 2d day. Abscission of small *prolapse of iris* on 5th day. No reaction. 21 days.	$\frac{20}{200}$. Coloboma and adherent iris. Disc. in 3 mos; $V = \frac{20}{100}$ 2 weeks later.
100	Mrs. Dillon. 65. Good.	Ripe. Normal.	Nov. 13, '87. Pupil excessively small. Iris reduced with difficulty. Patient restless. Prolapse of iris noticed on 4th day and cut immediately. Incarceration of iris in both corners. Healing smooth. 22 days.	$\frac{20}{200}$. Disc. in 2 mos. $V = \frac{20}{50}$.

In the subsequent remarks, to avoid repetition, I shall refer to my former paper in vol. xvi., p. 54, etc., of these ARCHIVES, and add only such statements as increased experience may suggest.

As to the **propagation** of the method of simple extraction, two authoritative voices in Germany have pronounced themselves in favor of this method. They are Prof. SCHWEIGGER, of Berlin, whose paper "The Return to the Flap-Operation," in vol. xvi., p. 447, etc., our readers, no doubt, have read with great interest, and Prof. SATTLER, of Prague, whose views are published in the Transactions of the Nineteenth Meeting of the German Ophthalmological Society at Heidelberg (September, 1887), page 92, etc., where also some very instructive remarks on this subject by Dr. E. MEYER, of Paris, are found. In the city of New York the simple method continues to be pursued, with critical consideration, by a number of oculists, Noyes, Bull, Grüning, Webster, and others. Bull reported[1] in the last meeting of the American Ophthalmological Society 36 cases without a loss (one eye, blind before, gave no visual result). Dr. Hasket Derby, of Boston, in an article just published and entitled: "On the Dangers of Simple Extraction of Cataract,"[2] writes: "I have been enabled to collect the notes of 48 cases of simple extraction performed in Boston within the last three years, nearly all by two surgeons, both of whom had had a large experience in the Graefe operation. Results: Central pupil in 31 cases, distorted pupil in 5, hernia of the iris in 12. Vision: 0.1 or more in 40, moderate in 5, $\frac{1}{\infty}$ in 2, still under treatment, 1." These results Derby justly considers as unfavorable and asks: "May not the operation, however, be restricted to certain cases, under special rules?" He comes to the conclusion: "Even if these or similar rules be followed, I cannot resist the belief that for the average surgeon, and in the present state of our knowledge, simple extraction, at the best, involves an element of danger that is wanting in the method of v. Graefe." The same criticism has been raised against the revival of the flap-extraction in Germany, England, and even in France, the country which is honored by its invention.

The following remarks will show on which side the present writer stands:

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[1] Transactions of 1887, vol. iv., p. 413.

[2] *Boston Med. and Surg. Jour.*, February 23, 1887, p. 189.

On the **preparation of the patient** before the operation I have nothing new to suggest. I have continued to operate in the patient's room and the

Method of Operating

has not been changed or varied in any thing essential since my publication in these ARCHIVES. Personally I have had no inducement to lay aside Gräfe's narrow knife and return to the triangular (Beer-Richter) knife, for I have found the former convenient and well adapted to its object. I have continued to place the patient on the operating chair, because the chair can be easily moved toward the window and the source of artificial light (I use a drop-light with an Argand gas-burner), and during the progress of the operation it can be readily turned, if need be, so that for each step the best illumination may be secured. To operate on the patient in his bed, as we used to do before the introduction of the combined extraction, has, no doubt, certain advantages, for I am afraid that the transport of a blindfolded person from the chair to his bed may, in some cases, cause displacement of the iris. This risk can, however, considerably be guarded against by letting him remain in the operating chair until the eserine has had its full effect in contracting the pupil, *i. e.*, about ten to fifteen minutes. At the expiration of that time the eye may be inspected once more, and any thing wrong, in particular a prolapse of the iris, be removed prior to the application of the definitive dressing. The consumption of time is compensated for by greater safety.

Before and since I became acquainted with Dr. F. Valk's iris-retractor,[1] I have drawn, with the well-known wire loop, the pupillary portion of the iris towards the centre of the section in order to facilitate the exit of the lens. This was done only in cases where, by rigidity of the sphincter portion of the iris, the pupil did not readily dilate, but I found that the pupillary edge of the iris was apt to be notched and a round pupil was not so easily reëstablished. In such cases, I think, a small iridectomy is preferable. The proposition of Valk to draw the iris towards the periphery prior to the opening of the capsule, has appeared very tempting to me, for it would enable us to make a sufficient peripheric capsulotomy, and thus obviate the frequent formation of posterior synechiæ inherent to the laceration of the centre of the capsule. Yet I have not tried it, because it introduces a new step into an operation that is already complicated and delicate enough, and the posterior synechiæ have thus far, in my practice, proved harmless. I await further information on the part of Dr. Valk, for everybody cannot try every thing.

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[1] F. Valk: Report of four operations for the removal of cataract without an iridectomy, and by an entirely new method. *The Post-Graduate*, New York, 1887.

It is of importance that the *flap be of sufficient size*;—for a ripe, hard cataract fully two fifths of the corneal edge of the limbus conjunctivæ. A conjunctival flap is somewhat in the way during the operation; but I think it acts favorably on the closure of the wound. That it is a protection from secondary infection I am fully convinced of.

Extended experience has confirmed Dr. Panas' and my own statements that the *peripheric location of the corneal section does not in itself favor the occurrence of prolapse of the iris.*

In the majority of cases the *capsule* was *opened* in the centre by a cystotome; some trials to open it at the periphery, by carrying the point of the instrument behind the iris, were not continued, because the escape of the lens proved not so easy as when the centre was opened. Yet I carry the point of the instrument high up, and add a horizontal stroke in the upper part, as v. Gräfe used to do. In this way the lens tilts very readily.

The mode of expelling the lens differs from that used in the combined extraction. The pressure should be made through the cornea on the lower portion of the lens, directly towards the centre of the globe. In this way the flap rises, tilts forward, and the lens passes through the pupil with the least bruising of the iris. This is the old classical procedure; but we have gradually departed from it, because in the combined method the lens can be pressed out more directly, whereas in the simple extraction direct upward pressure would be counteracted by the iris stretching like a retentive bandage over the advancing edge of the lens.

In a number of cases, in all where the centre of the capsule was thickened, I tried to *remove the pupillary portion of the anterior capsule*, and mostly succeeded. I used for that purpose a pair of Mathieu's iris-forceps, the teeth of which are on the back, but close to the point. This instrument, the excellent and well-known modification of Liebreich's iris-forceps, has been invaluable to me since I first saw it in London in the year 1871.[1] I am not aware that the numerous capsule forceps which have been described during the last years are in any way superior to Mathieu's. The indications for removal of the central part of the anterior capsule have not been very frequent in the present series. It is not impossible that I may soon try to do this step in every case as is recommended by many operators. During several years I have done it regularly in Gräfe's operation, but for the present I seek to obtain the maximum of visual acuteness by an after-operation. More of this hereafter.

The *removal of the cortex* was done, in the first place, by following up the escaping cataract with the spoon, continuing the pressure, so that, if possible, the whole cortex came forth with the lens. A great deal can be accomplished in this way by judicious, bold, and quick action. The moment the lens is out the speculum should be removed, and in case any remnants lag behind, they should be wiped out with the edge of the lower lid, taking care that neither the edge of the upper lid, nor any other organic part, be passed through the wound. If there is a conjunctival flap, the remnants can be stroked out by passing the edge of the lower lid or a blunt spatula over it. These pressing movements with the lower lid, which can be done boldly and without injury, are very efficient, and it seems to me that where they fail other means are not likely to succeed.

During the operation, and immediately after it, the eye, especially the wound, was frequently *irrigated with Panas'*

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[1] See my description of it and my appreciation of its advantages in these ARCHIVES, vol. ii., pt. 2, p. 158, 1872.

solution, not only to prevent infection, but also to counteract the rapid exsiccation of the surface of the cornea. When the iris was reduced and the pupil round and central, I injected, with a delicate lachrymal syringe, a few drops of this solution into the anterior chamber, passing the nozzle of the instrument along the whole wound canal, while the liquid was flowing out. My object was to sterilize the whole region of the wound, not to remove coarse remnants of lens. When a good deal of manipulatlon had been necessary to clear the pupil and reduce the iris, I injected a larger quantity. When, on the other hand, the lens came out entire and the iris re-entered the anterior chamber spontaneously, or by easy manipulation with the lid or probe, I only irrigated the lips of the wound, omitting the intra-ocular injection altogether, or making it very slight. If much of this antiseptic is injected, it occasions considerable irritation, burning and pain for from nine to fifteen hours, yet I have never seen it cause any inflammation. When blood, pigment, or small granular and flaky remnants of cataract render the pupil and iris dull I syringe them out with Panas' solution. This procedure is easy, and has a surprising effect. As an example, case No. 87 may be cited:

Dr. C., æt. sixty-three, suffering from glycosuria, but being otherwise in good health. After the cataract was removed and the iris reduced, the pupil and anterior chamber contained an unusual amount of iris pigment. On syringing it out the escaping liquid looked like a blackish emulsion. The pupil and chamber became entirely clear. He had intense pain for fifteen hours, but then he was completely free from it. Healing undisturbed; $V = \frac{20}{20} +$.

The abundance and easy separation of iris pigment in this and similar cases may find its explanation by Dr. Kamocki's anatomical researches of diabetic eyes.[1] The uveal cells became enlarged and dropsical, the whole layer is thickened and contains cyst-like cavities. (See the drawings on plates II. and III.)

I have used no other *antiseptic* than the solution of

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[1] See his paper in the present number of these ARCHIVES, p. 41.

Panas; not that I consider it superior to all others, but because I am not particular in the choice of these means as long as they do not irritate. I would just as gladly use the mercuric bichloride, or a very weak solution of nitrate of silver, or properly diluted chlorine water, had I a tendency to experiment with remedies. Since I began to use Panas' solution and the precautions described in my previous paper, I have performed one hundred and fifty-nine extractions, and lost only one eye (the case of suppuration, No. 22, in my previous paper), in a patient suffering from diabetes and dacryo-cystitis purulenta. In ophthalmic surgery, now as before, I lay the greatest stress on smooth operating, which means to create no condition favoring the multiplication of bacteria. There are, more or less, germs in every conjunctiva, and we cannot destroy them if we do not destroy important tissue elements. These germs, however, will not multiply as long as the organ is healthy, but they multiply if bruised and necrosed particles, or serous and sanguinolent transudations prepare for them a suitable nutrient soil. The vitality of bacteria, and in most species also their quantity, play an important part concerning the full development of their action. We know that the resistances of a healthy organism to most bacterial invasions are great—certainly to the invasion of a moderate quantity of pyogenic germs. If truly virulent staphylococci, when they are cautiously (*i. e.*, without too much bruising of cornea and wounding of iris and lens) injected into the anterior chamber, disappear without a trace; if the same microbes, injected into the veins, cause suppuration only when there is a weak point in the body, for instance a fracture, it is clear to everybody, even to those not familiar with Metschnikow's phagocytes, that the healthy body possesses the means of successfully resisting many a microbian invasion, and that in our particular case an eye, correctly operated on, is not doomed to destruction if a few microbes lodge in its conjunctival sac or get into the wound. I may here recall some experiments which I published in these ARCHIVES two years ago, viz., that out of six inoculations of truly virulent staphylococci into the same cornea, only one developed into a pestule; further, that an emulsion of stapylococci dropped into the conjunctival sac of rabbits, from which I immediately afterward extracted the lens with clean instruments and without using any antiseptic, produced no suppuration; whereas a small knife dipped into the same emulsion and used for extractions, produced it regularly. Are we not justified in assuming that no knife, not even the smallest and sharpest, can be thurst through a cornea without a certain degree of bruising? Prof. GAYET, of Lyons, after carefully disinfecting the eyes of his cataract patients, found, by test-tube cultivations, microbes in the conjunctival sac in seventy-five per cent. of the cases; but is he correct in saying that these germs are not all pathogenic because there was suppuration only in 6½ per cent. of the patients he operated on?

His second conclusion, being the immediate result of his very numerous experiments (two hundred and thirteen test-tube cultivations), must, however, be admitted, without reserve, and has a great practical bearing. It reads as follows: The employment of antiseptic or aseptic substances appears to have only a very slight (*bien minime*) influence on the presence of germs in the conjunctival sac; or, in other words, whatever we do, we are never sure to eliminate them from the field of eye operations.

We may fairly assume that it is impossible to make a cataract operation without setting up conditions that are more or less favorable to bacterial growth. If we further believe—and for all practical purposes nobody can refuse to believe—that there is no suppuration without bacteria, we have to act accordingly, omitting nothing that is calculated to assist in securing success. Even at the risk of repeating well known truths, I beg leave to lay down the following **general rules for guidance in our cataract operations:**

1. Keep out bacteria or wash them off by germless, unirritating liquids: boiled water, boric acid and other indifferent substances dissolved in boiled water.

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[1] Gayet: Recherches expérimentales sur l'antisepsie et l'asepsie oculaires. *Arch. d'Ophthal.*, Sept.–Oct., 1887, p. 403.

2. Prevent the multiplication of germs by antiseptics: watery mercuric bichloride, or alcoholic biniodide, chlorine water, nitrate of silver, and other substances in very weak solutions.

3. Perform the operation with the utmost degree of neatness and accuracy, and with a minimum of traumatism, avoiding bruising, scratching, and tearing of any kind, so as to reduce septic conditions to a minimum.

4. Endeavor to obtain primary union by freeing the wound from all foreign substances, by perfect coaptation of its edges, and by maintaining the greatest possible immobility of the organ until the closure of the section is firm.

5. Avoid constitutional infection of the wound. It is dangerous to operate for cataract as long as the constitution of a patient is under the active influence of a specific disease; for instance, articular rheumatism, acute or chronic suppuration, syphilis, and the like. In some incurable diseases—for instance, diabetes—we must select the time when the vitality of the patient is least reduced.

All these rules are clear and have been sufficiently discussed, only in regard to the fourth I would like to make a few remarks. The endeavor to cure our patients "jucunde," that is, with as little discomfort as possible, has of late, it seems to me, been carried too far. SNELLEN sends some of his patients into the garden the first days after the operation. CHEATHAM removes the cataracts in a lecture room before the students, and immediately after lets them drive home in a country carriage, ten or more miles. MICHEL, of St. Louis, CHISOLM, and others, close both eyes with simple plaster, or even leave the eye not operated on open, allowing the patient, from the first day of the operation, to remain up and look about. There is no doubt that under all these conditions multitudes of eyes recover. It is incredible what a healthy eye can endure. But demonstrate by statistics large enough to exclude the element of chance, that such procedures are beneficial, or at least harmless, and I shall gladly remove all restraints from my patients. Suppose I extracted a cataract in the large hall of the New York University Medical College (where gelatine plates, exposed only a few minutes, develop any number of germ colonies), and then let the patient drive home to some village on Long Island. Suppose that this patient loses his eye, as possibly he may, for, all other things being equal, the lecture room as an operating theatre and the drive to his home are certainly no guaranty of success. And suppose that he accuses me of negligence and sues me for damages, it is sure that my counsel would have some difficulty to convince every one of the twelve jurors that I could not have acted more carefully. If there is no other possibility, and the patients want to have it so, as in the case of Cheatham, then, of course, they take the risk. With regard to the court-plaster dressing and letting the patient have the partial use of his visual organ, Dr. Chisolm, in my opinion, also goes too far, surely for eyes whose cataracts have been extracted without iridectomy. The light which shines through the plaster induces the patient to wink and move his eye. Apart from that the stiff plaster is not the height of comfort. Patients with whom I have tried it, preferred the flannel bandage. If it is alleged that the flannel bandage presses on the eye and flattens the cornea, then the first rule of the classical binoculus has been disregarded by the dresser, namely, to pad up the corners of the eye and put only a little cotton on the top, so that an elastic and even pressure, free from any inconvenience, keeps the eyeball in a degree of immobility that is secured, as far as I have experience, by no other kind of dressing. In summer, flannel is too warm, and there are some restless patients who will disturb the roller. In such cases the linen gauze and cotton-wool can be kept in position by strips of adhesive plaster. This mode of bandaging, of course not new, is quite convenient, but secures the immobility less than the contentive and elastic flannel roller. The superiority of Dr. Chisolm's bandage is not borne out by his statistics.[1] Five per cent. of loss and five per cent. of $V = \frac{1}{\infty}$ is below the average success of experienced and skilled operators, to the front rank of whom, we all know, Dr. Chisolm belongs.

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[1] See the paper by Dr. Belt, his assistant, at the beginning of this volume.

Of the **accidents** occurring during the operation the following should be mentioned:

1. In one case, No. 71, a small part of the periphery of the iris *fell before the knife*, and was cut off. No consequence. Pupil round, central, movable, $V = \frac{20}{20}$.

2. *Prolapse of vitreous* in five cases, Nos. 14, 24, 30, 70, 96. In four of them the iris was pressed back. All got well without incarceration, and obtained good vision.

The **wound complications**, which can be studied in detail in the foregoing tabular synopsis, may be summed up as follows:

Prolapse of the iris occurred in *twelve* cases.

In *one*, the case of suppuration by secondary infection, the iris filled the gap when the previously closed wound had re-opened.

In *four* cases the prolapse *disappeared spontaneously* in the course of some months.

In *four* others it was removed with scissors.

In *one*, produced by a hurt, it was reduced two hours after its occurrence. No reaction followed, and the pupil was clear and central.

In *two* cases the prolapse remained, but I shall remove it if, on the patient's return, it has not disappeared.

In *eight* cases the iris did not protrude, but was more or less extensively united to the scar. Slight, partial adhesions have probably occurred more frequently, but have either not been noticed, or have not been noted on account of their harmlessness.

If I still mention *three cases* in which the iris was *pressed back* by advancing vitreous, I have stated all the anomalies of position which the iris has presented. They occurred in twenty-three patients, all of whom, however, regained good sight, except the one with suppuration. This calamity was, of course, not caused by the prolapsed iris. The patient was an innkeeper, addicted to drink, and suffering both from dacryo-cystoblennorrhœa and diabetes, having from 5 % to 8 % of sugar in his urine, when he came to be operated on for his other eye, in which the operation was successful, in spite of his diabetes.

One case of suppuration in a hundred seems little enough, but it is one case too many. Since that time (November, 1886) 124 extractions have been made without a trace of suppuration, and without any serious inflammation. More or less filiform posterior synechiæ were all the reaction that occurred, and vision was good in every case.

Twenty times the presence of *iritis*, or posterior synechiæ, is noted, but there were only two cases in which the inflammation was of some intensity, leading to incomplete obstruction of the pupil. In the one the pupil cleared up spontaneously, in the other discission was made; good sight was obtained in both. Cyclitis has not occurred at all. The fact that of late not only the suppurative processes, but also the other severe forms of inflammation, irido-cyclitis, etc., have likewise became scarce, was lately mentioned by Prof. SATTLER, before the Medical Society of Prague, and is exemplified also by the present report.

After-operations.

In spite of this remarkable freedom from inflammation, the *pupillary area has not been so unobstructed as I anticipated.* As a rule, the centre of the capsule had been freely ruptured, yet only rarely did the pupil become clear enough to render a subsequent discission useless. Thus far, discission with a knife-needle has been made in fifty-four cases of the series under consideration, and will be made in others if the patients return and show that their vision can be improved. I dare say that there is no operator who performs after-operations in so large a percentage of cases as I do. The reason is, not that the primary results obtained by me are below the average, but that I am not satisfied with results that satisfy others. Most operators consider $V = \frac{20}{40}$ or $\frac{20}{50}$, even $\frac{20}{70}$, as sufficiently good, and so it is for ordinary purposes, especially in a patient who has been blind before. When, however, other patients consult us for vision so much impaired, we do not tell them: "Go home again; your sight is good enough"; but we try to raise it with glasses, and when we succeed in bringing it to $\frac{20}{20}$ or $\frac{20}{30}$, we feel sure to have essentially increased their happiness and usefulness. It will at once be objected that the use of glasses is harmless, but an operation is never free from a certain risk. This is not only true, but some cases have come to my notice where, after a tolerably successful extraction, the sight was destroyed by suppuration following needle operations. The danger of needling is proportionate to the density and the age of the pupillary membrane. Capsules not thickened by products of inflammation, can be cut easily and without danger, be it shortly or long after the extractions. Pseudo-membranes, after iritis or irido-cyclitis, must be dealt with very cautiously. If they show a place of presumably slight resistance, a discission can be made in that place with a knife-needle, or a laceration with a double needle. In less favorable cases the safest operation is an iridectomy, comprising a part of the pseudo-membrane. For many years, and after different trials with iridotomy and other procedures, *I have preferred the excision of a piece of capsule and iris to all other methods.* I thrust a Beer's knife through the cornea and the pseudo-membrane, splitting the latter about 3 *mm* in length. Then I pass the loop of a Tyrell's blunt hook through the opening of the false membrane, draw the latter out and cut it off, together with a small piece of adjacent iris. These two operations, discission with a knife-needle (rarely with two), and iridectomy with Tyrell's hook, are the only ones I practise for secondary cataract. The first is very frequent, the second has become quite rare. Last year I made only one, in an old case. The reaction was nought, and the result brilliant. I will say nothing against other operations, for instance Wecker's iritomy; every one avoids dangers in operations to which he is accustomed. I only want to state what in my own hands has proved best.

It is needless for me to say that the after-operations have to be done with the same precautions as the primary. We must not think that a needle is a small innocent tool. If it tears and bruises it creates favorable conditions for non-specific processes, I mean simple exudative and plastic inflammations, as well as for the growth of bacteria should any have been introduced with the needle itself, or still harbor in the eye, lying dormant after non-deleterious suppurative processes. They may also be in the system. The eye will then be a point of minor resistance where bacteria are used to settle.

In the great majority of cases the secondary division of the anterior capsule was followed by no or only very slight reaction, the patient being discharged in four or five days. In a certain number simple irritation or serous inflammation was noticed, marked by circumcorneal injection, even slight swelling of the conjunctiva and dulness of sight from diffuse turbidity of the vitreous. The iris was somewhat discolored, but adhesions did not appear nor did the capsular opening become occluded. There was pain and occasionally some increase of eyeball tension connected with it. exposure to light and cold, as every imprudence, made these cases worse. They all recovered with improved sight. Most of them got quickly well by salicylate of soda, alone or with leeches applied to the temple. In one or two, where the eyeball appeared harder, I instilled eserine, but it increased the pain, whereas atropine was well borne.

In one case (No. 41) a simple division of a wrinkled, not thickened, capsule produced an attack of *acute glaucoma.* The patient had Bright's disease and was an inveterate drunkard. The attack of glaucoma followed the division within 24 hours. +T 2 was reduced by eserine the next day, but on the third it was fully +T 2 again, the sight, $\frac{20}{70}$ before the operation, had fallen to quantitative perception of light. I made an iridectomy in the upper part, the incision posterior to the previous corneal section. The relief was instantaneous, the recovery prompt, and the sight good.

In no case the vision became worse by the secondary operation. How much the vision was increased in the single cases can be seen in the tabular synopsis, which, however, does not express the full visual gain, as in very many cases the last record taken was at the patient's discharge from the hospital, that is, on the fifth day, when the vitreous has not entirely cleared up. For the sake of comprehensiveness I will survey the cases in which discission (the only after-operation done in the present series) was performed.

The gain in sight, as is evident from the table, was very great. $V = \frac{20}{20}$ was attained in 17 cases, to which only 4 are added in which perfect sight was restored without a secondary operation [Nos. 3, 21, 50 (extraction with the capsule), 87 (removal of anterior capsule)].

The subsequent division of the capsule has, therefore, played as important a part in this series of operations, as in the former ones where iridectomy was made and the capsule opened at the periphery only. If we want to give our patients the highest degree of visual acuteness obtainable, we have, as WECKER says, either to split the capsule later, or remove a piece of it during the first operation. And in the latter case even then, I may add, the subsequent wrinkling and dotting of the posterior capsule may render a discission advisable in many cases.

Primary vision.	In cases.	Ultimate vision.	In cases.	Primary vision.	In cases.	Ultimate vision.	In cases.
$\frac{20}{40}$	2	$\frac{20}{20}$	2	$\frac{20}{200}$	18	$\frac{20}{20}$	2
$\frac{20}{50}$	7	$\frac{20}{20}$	4			$\frac{20}{30}$	6
		$\frac{20}{30}$	3			$\frac{20}{40}$	3
$\frac{20}{70}$	12	$\frac{20}{20}$	6			$\frac{20}{50}$	2
		$\frac{20}{30}$	3			$\frac{20}{70}$	4
		$\frac{20}{40}$	1			$\frac{20}{100}$	1
		$\frac{20}{50}$	2	$\frac{15}{200}$	2	$\frac{20}{40}$	1
$\frac{20}{100}$	9	$\frac{20}{20}$	3			$\frac{20}{100}$	1
		$\frac{20}{30}$	2	$\frac{12}{200}$	1	$\frac{20}{200}$	1
		$\frac{20}{40}$	1	$\frac{10}{200}$	1	$\frac{20}{200}$	1
		$\frac{20}{50}$	1	$\frac{8}{200}$	1	$\frac{15}{200}$	1
		$\frac{20}{70}$	1	$\frac{4}{200}$	1	$\frac{20}{50}$	1
		$\frac{20}{100}$	1				
					54		54

The Ultimate Visual Results

obtained, according to the last examinations that could be made, were as follows:

$\frac{20}{20}$	in	21	cases.
$\frac{20}{30}$	in	18	cases.
$\frac{30}{40}$	in	11	cases.
$\frac{20}{50}$	in	8	cases.
$\frac{20}{70}$	in	16	cases.
$\frac{20}{100}$	in	12	cases.
$\frac{20}{200}$	in	10	cases.
$\frac{15}{200}$	in	3	cases.
$\frac{10}{200}$	in	1	case.
0	in	1	case.
——		100	cases.

If we classify the results in the customary manner we have: 96% of good results, 3% of moderate results, and 1% of failure.

These figures speak for themselves. It will be noticed with satisfaction that the lowest vision was $\frac{10}{200}$, and that the ominous symbol $\frac{1}{\infty}$ does not appear in this series.

Considering these results I need not say that I have continued to extract cataract according to the same method.

AN APPARATUS FOR THE DETERMINATION OF REFRACTION AND ACUTENESS OF VISION.

By Dr. FERD. PLEHN, Berlin.

Translated by Dr. J. B. McMahon, New York.

(*With eight wood-cuts.*)

THE numerous drawbacks connected with the use of the case of trial lenses in the determination of errors of refraction, attract very forcibly the attention of all who are called upon to make such examinations in large numbers. They often prove rather a trial of patience for both physician and patient, with the constant unavoidable soiling and misplacing of the lenses, their falling out of the spectacle frames, their mistiness on hot days, etc. Add to all this the want of accuracy in the glasses, and the clumsy and still costly character of the whole apparatus, and we can well understand why the perplexed ophthalmologist time and again sighs for a satisfactory substitute for his trial case.

Involuntarily his thoughts will wander to an ideal lens, provided with an arrangement for altering the focal distance, a thought to which both Snellen and Landolt have given expression.[1] Such an instrument evidently would give the *coup de grâce* to the miseries inherent in the trial case.

The Stokes lens has at least in part solved this question for cylindrical glasses, and its existence shows that the idea of a lens of adjustable focal distance must not be relegated to the realms of impossibility. So too with the combination of two prisms in which a complete series of prismal powers are obtained by rotation about a common axis.

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[1] Handbuch der gesammten Augenheilkunde von Gräfe und Sämisch. Bd. iii., p. 79. There we read as follows: "It would be a marked advantage to possess lenses of variable strength in such a way that we might get with rapidity a greater or less refractive power which could be read off the instrument directly."

As will be shown later, we may employ a combination of two convex glasses with arrangements for altering their relative position, not only to replace the entire set of trial glasses, but to supply the equivalent of any imaginable spherical lens. The same holds true correspondingly for a combination of two convex cylindrical lenses.

On practical grounds we have united the two lenses in a short, telescope-like instrument. It consists of two pieces, one sliding within the other. In each piece is fixed a plano-convex lens of 5 *cm* focal distance. The lenses have their convex surfaces turned to each other, and at first are separated the sum of the two focal distances.

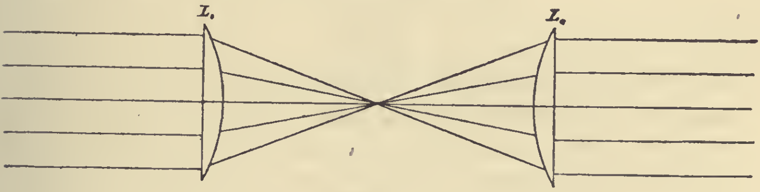

FIG. 1.

In this adjustment of the apparatus (Fig. 1), which we shall call the zero-position, rays falling upon one lens parallel to its axis, will, after passing through it, intersect at the common focal-point, and will emerge from the round lens again parallel.

In the zero-position, accordingly, the system acts upon parallel rays as a plane lens, except that the order of the rays is reversed.

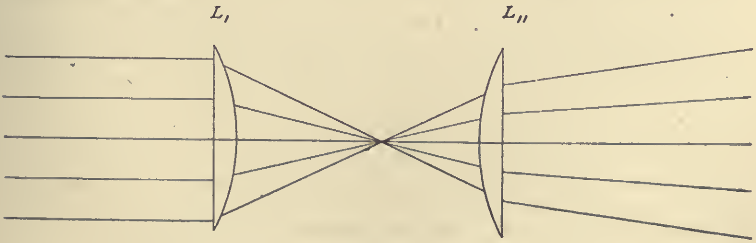

FIG. 2.

Let us now lessen the distance between the glasses, approaching the second to the first. The relations of the rays to the first lens are still the same. On emerging from it, however, the rays cross at a point between the second lens and its focus (Fig. 2). On passing through this, therefore, they are no longer parallel, but divergent; the more so, the nearer the lenses are approached to each other.

On the other hand, the opposite condition, *i. e.*, the convergence of the emerging rays, results when the lenses are separated farther apart than in the zero-position (Fig. 3).

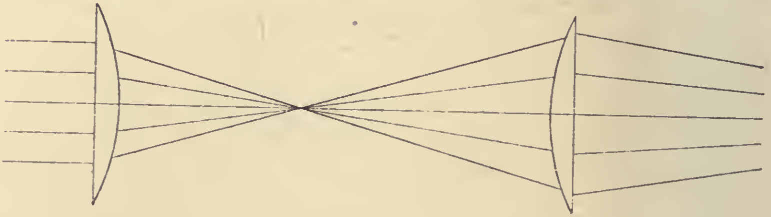

Fig. 3.

It is, therefore, easy to see that by altering the relative position of the lenses, rays entering parallel may be made to emerge with any possible degree of divergence or convergence; or, in other words, by means of such an apparatus we may obtain the equivalent of any imaginable spectacle glass.

Still, two very serious defects are attached to the instrument in this simple form. These are, first, the variability of the visual angle, and secondly, want of uniformity in the division of the scale. These drawbacks are easily remedied if we follow the directions given by Nagel[1] with reference to the adjusting of optometer lenses.

The importance of the subject demands a more than passing attention to the rules laid down by Nagel.

It requires but a moment's reflection to see that the instrument we are dealing with is nothing but a telescope having an objective and eye-piece of the same focal distance. It has accordingly been called a telescope without magnifying power. This statement, however, harbors an inaccuracy, for only objects situated at an infinite distance are seen without enlargement through the instrument by the emmetropic eye, all others being magnified ; the less the distance, the greater the effect. The enlargement is not perceptible to the eye unless the objects are nearer than four metres. One can easily convince himself of this by vision *à double vue*. All this, however, is true only for the emmetropic. For the ametropic the conditions are again different.

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[1] Handbuch der gesammten Augenheilkunde von Gräfe und Sämisch. Bd. vi., p. 315, u. ff.

This becomes at once clear if we analyze the action of the telescope.

As is well known, the objective gives an inverted image of the object, which image is viewed through the eye-piece as with an ordinary magnifying glass. The emmetropic unite parallel rays, and therefore adjust the eye-piece in such a position that the inverted image lies at its focus ; for in this case the rays which emerge from it become parallel. Myopes, requiring divergent rays, push the eye-piece in, whilst hypermetropes draw it out to obtain convergent rays.

The use of the instrument in measuring refraction rests plainly upon these variations in its adjustment (the so-called Burkhard-Badal principle). The myope, therefore, views the aërial image at shorter range than the emmetrope, the latter again nearer than the hypermetrope. Accordingly, myopes view the objects under the greatest, hyperopes under the least visual angle.

For these reasons no direct determination of visual acuteness can be made with the apparatus. We must either make a calculation for each individual case, or work out a table which would cover all possible cases. Apart from the question of the visual acuteness, however, the mere determination of the refraction would be prejudiced by this varying of the visual angle, as the seeming increase or decrease in the size of the object leads to accommodative efforts, and so masks the true refractive condition.

The gradation of the instrument is equally lacking in uniformity.

If we calculate what distances of the lenses correspond to definite equal refractive intervals, we obtain steadily increasing results. This is particularly disproportionate on the positive side of the scale. To replace a spectacle glass of + 15 dioptries, the tube must be 25 *cm* long, for + 18 dioptries 55 *cm*, and for + 20 almost of infinite length.

We must therefore abandon the idea of replacing the stronger convex glasses by this method.

Hirschberg's optometer corresponds essentially to the above description, as it was constructed before the publication of Nagel's rules. It consists of a small telescope with an objective of 40.5 *mm* and an ocular of 27 *mm* focal distance. Hirschberg was the first to employ the astronomical telescope for optometric purposes.

The "refractometer" devised by von Graefe is a double-barreled Dutch telescope (the ordinary opera-glass). It therefore magnifies under all circumstances, but in different degrees, according to the refractive condition of the eye. Moreover, it has oculars of three kinds, which makes its employment much more difficult.

Let us now, on the other hand, follow Nagel and place the instrument before the eye in such a way that its nodal point coincides with the focus of the ocular, and we obtain not only a scale short and uniformly graded, but also a constant visual angle for all conditions of refraction.

The instrument is so arranged very simply, either by having the tube project over the eye-piece 38 *mm* or, much preferably, by fitting upon the ocular extremity of the tube a cap of that length, provided with a round central opening.

From Fig. 4 it is seen directly that the object is viewed under the same visual angle in all conditions of refraction when the ocular is placed before the eye in the above-described position. The objective has been omitted from this and the following figures for the sake of brevity.

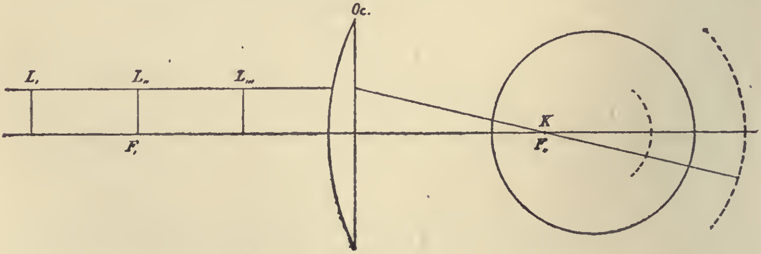

FIG. 4.

Oc is the ocular, $F_{\prime\prime}$ its posterior focal point, coincident with *K*, the nodal point of the eye. $L_\prime$ $L_{\prime\prime}$ $L_{\prime\prime\prime}$ are the inverted images at different distances from *F*, the anterior focal point of the lens. The dotted lines indicate the retina of a hyperopic and a myopic eye.

The use of the cap produces a still more marked change on the scale gradation. Equal displacements of the lens correspond to equal differences in refraction. In the present case (the lenses having a focal distance of 5 *cm*) an alteration of the distance between the lenses of 2.5 *mm* corresponds exactly to a dioptrie. Taking + 20 D and — 20 D as the limits of the scale, its whole length is 10 *cm*. The instrument thus gains also in handiness.

The proof of this equidivision of the scale we give as follows, after Nagel.

In Fig. 5 let *R* signify the actual far-point, and $R_\prime$ the same brought nearer by the lens. At $R_\prime$ is the inverted image of the test letters. $F_\prime$ is the anterior, $F_{\prime\prime}$ the posterior focus of the lens. *C* is its principal point. *K*, the nodal point of the eye, coincides with $F_{\prime\prime}$. Represent the distance *RK* by *r*, and $R_\prime K$ by $r_\prime$. We have now to find an expression in the given quantities for the distance $F_\prime R_\prime$, which, as can be seen, measures the displacement of the lens from the zero-position.

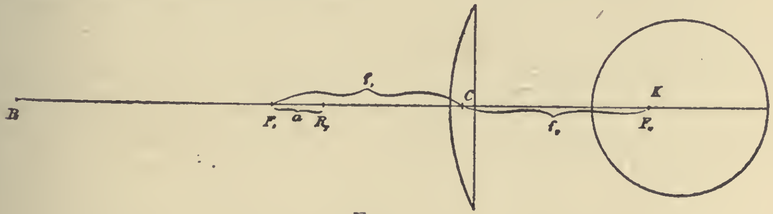

FIG. 5.

This we obtain as follows :

The two points *R* and $R_\prime$ are conjugate foci of the lens *Oc*.

$$\therefore \frac{1}{f} = \frac{1}{R_\prime C} - \frac{1}{RC}$$

For R,C can be substituted $r' - f$.
“ RC “ “ $r - f$.
“ $r_\prime - f$ “ “ $f - a$.

$$\therefore \frac{1}{f} = \frac{1}{f-a} - \frac{1}{r-f}$$

$$(f - a)(r - f) = f(r - f) - f(f - a)$$

Expanding, we get $fr - f^2 - ar + af = fr - f^2 - f^2 + fa$.

This reduced gives $ar = f^2$

$$a = \frac{f^2}{r}$$

Let us consider $\frac{f^2}{r}$ made up of the two factors f^2 and $\frac{1}{r}$. Now the expression $\frac{1}{r}$ represents at the same time the refraction of the eye and the glass needed for correcting the error of refraction (supposed to be placed at the nodal point of the eye). Substituting for $\frac{1}{r}$ successively 1, 2, 3, etc., dioptries, we obtain for the corresponding values of a: f^2, $2f^2$, $3f^2$, etc.

The unit for the division of the scale is thus found to be f^2, which in the present case is 2.5 *mm.* If we move the lens this distance from the zero-position, the instrument produces the same effect on parallel rays as a spectacle-glass of 1 dioptry, *i. e.*, having a focal distance of 1 metre. A furthur displacement of 2.5 *mm* gives the equivalent of 2 dioptries.

This scale applies also, however, when the focus of the lens is made to coincide with the anterior focus or with the principal point of the eye. In the first case the instrument shows what glass placed at the anterior focus of the eye would make the eye emmetropic.

As, in practice, glasses are ordinarily worn at about the anterior focus of the eye, this arrangement of the instrument is to be preferred to the other two. In adopting it, however, we reject the much more important advantage of having a constant visual angle.

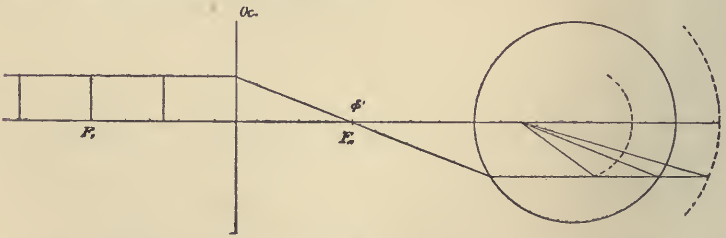

FIG. 6.

If we make coincide the focal point of the lens and of the eye, the object viewed is with different visual angle under different conditions of refraction, although in all the three conditions the retinal images have the same size. Fig. 6 shows this.

This last property might well be of value under certain circumstances.

The other adjustment, *i. e.*, with the focal point of the lens at the principal point of the eye, is, however, of no advantage whatever.

A third arrangement, in which the principal point of the lens coincides with the anterior focal point of the eye, has been adopted by Landolt and Loireau for their optometer. It also gives retinal images of the same size under different refractive conditions, but does not allow of a uniform scale-division. If, instead of the arrangement with the nodal point of the eye and the focus of the lens coinciding, we choose to adopt one of the three others, the instrument may be provided after Seggel's example with a sliding cap.

Seggel's optometer is based upon the old Burow's instrument. This latter is a tube closed with ground-glass, in which a much diminished photograph of Snellen's test-types is placed. This is viewed from the other end of the tube through an adjustable lens.

Seggel has improved the instrument by adopting the arrangement of Nagel. Further, he provides it with a second tube which, however, terminates in a blind extremity. But this alteration does not remove the force of the objection, raised originally against the old instrument of Burow, viz., that it does not supply an exact method for determining refraction, as the person under examination accommodates involuntarily, controlled by the idea that he is to distinguish objects sharply inside a short closed tube. No such misimpression comes into play in the case of the telescope. The party examined understands that he is expected to fix his gaze on a distant object, and so involuntarily relaxes his accommodation. The small inverted aërial image situated within the instrument does not come within his cognition.

For these reasons we choose to adopt the arrangement with the focus of the lens at the nodal point of the eye.

There still remain a few points for brief consideration.

As may be remembered, the zero-position of the instrument was defined such that the vertices of the two lenses were distant from each other exactly the sum of their focal distances. In this position, it is true, rays entering parallel, also emerge parallel. However, rays coming from any point of the test-types, which are placed 4 to 6 metres distant, are not parallel but slightly divergent, as they fall upon the objective. The aërial image formed by the objective, therefore, is not situated at the common focus of the two lenses, but a little nearer the eye-piece (a difference of 0.5 *mm* when the test-types are 5 metres distant). The rays, therefore, after their last refraction, do not emerge parallel from the objective, but slightly divergent. If we wish to have absolutely parallel emergent rays, the distance between the lenses must be increased by the distance which separates the inverted aërial image from the focus (0.5 *mm*). The image and the focus of the ocular now coincide, and we again have parallel emergent rays.

It would be certainly more exact so to adjust the zero-point that the emergent rays produced backwards would intersect at the point from which they originally proceeded.

They would then fall upon the eye after passing through the instrument with the same divergence as if the object were viewed with the unassisted eye.

The error dependent on this is, however, so slight that it may be disregarded.

We distinguish in the instrument the absolute and the relative zero-position. The former holds for parallel, the latter for divergent rays. In the former, the vertices of the lenses are separated by the sum of their two focal distances. In the latter, the distance between the two is such that after the last refraction the emergent rays, if produced backward, would intersect at their point of origin.

If the relative adjustment is disregarded, the absolute being employed for divergent rays also, these latter, after refraction, will appear to proceed from a point which lies nearer than their point of origin by four times the focal distance of the lens used in the instrument. The use of the absolute zero-position, therefore, means an approximation of the object viewed $4f$.

The proof is as follows :

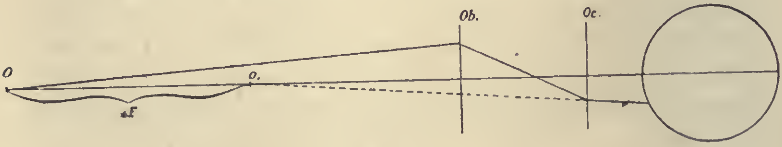

FIG. 7.

Let E be the distance of the object viewed, O, from the principal point of the ocular ; f', the distance from O to the principal point of the objective ; f'', the distance from the principal point of the objective to the conjugate focus of O ; φ', the distance of this point from the principal point of the ocular ; finally, φ'', the conjugate distance of φ' for the ocular lens. The value of φ'' is expressed in the formula :

$$\varphi'' = \frac{\phi' \; F}{\phi' - F}$$

$$\text{But } \varphi' = 2 F - f''$$

$$f'' = \frac{f' \; F}{f' - F}$$

$$f' = E - 2 F$$

By substitution of these values, the first equation gives

$$\varphi'' = \frac{F^2 E - 4 F^3}{- F^2} = - (E - 4 F).$$

The negative sign merely indicated the direction in which φ'' is to be measured from the principal point of the ocular lens. The absolute value of φ'' is, therefore, as follows :

$$\varphi'' = E - 4 F.$$

If now the test-types are placed at a distance of 5 metres, the instrument, when used in the zero-position, causes an apparent approximation of the tests to the extent of $4 F = 0.2$ metre. The instrument, in this case, acts like a concave lens of 120 metres' focal distance (= + 0.008 D). When the test-types are 4 metres distant, it acts as a concave lens of 76 metres' focal distance (= + 0.013 D). These quantities can be disregarded without more ado.

On the other hand, if one desires to utilize the optometer for near work, the relative zero-position must be determined for each separate distance. Under these circumstances the scale generally takes another form.

There is so much the less necessity for anxiety over this point, as the sources of error in using the best glasses for the determination of refraction are far more numerous and important.

For the same reason we leave out of consideration the magnifying of the test-types. By computation or, more directly, by vision *à double vue*, it is readily seen that the error is exceedingly slight for a distance of the test-type of over 4 metres; indeed it is scarcely discernible by the eye, provided only the nodal point of the eye coincides with the focus of the ocular.

Let γ represent the size of the retinal image of a distant object G. They are to each other as their distances from the nodal point of the eye. Let φ'' represent the distance of the nodal point from the retina ; E, the distance of the object G from the nodal point. Then

$$G : \gamma :: E : \varphi'' \quad (1).$$

If the object is viewed through the apparatus by an emmetropic eye, the ratio of G to its inverted aërial image, which we shall call g, is the same as that of their respective distances from the principal point of the objective. Or,

$$G : g :: f' : f'' \quad (2).$$

This ærial image bears again the same proportion to its retinal image γ' as the the focal distance of the lens to φ''. So,

$$G : \gamma' :: F : \varphi'' \quad (3).$$

Multiplying proportions (2) and (3) and reducing, we obtain

$$G : \gamma' :: f'\,F : f''\,\varphi'' \quad (4).$$

Let us now divide (4) by (1), substitute for f'' its value $\frac{f'\,F}{f'-F}$ and clear of fractions, and we obtain

$$\gamma : \gamma' :: f' - F : E.$$

When the test-types are 5 metres distant, $E = 5\ m$, and $f' - F = 4.8\ m$. The enlargement of the retinal image is, therefore, $\frac{5}{4.8} = 1.04$.

Having finished these discussions, we may now pass to the practical application of the instrument.

Use of the Apparatus to Determine Refraction and Visual Acuteness.

In the practical application of the instrument, exactly the same rules hold as in the ordinary determination of refraction with trial glasses.

The main rule is, therefore, to allow the patient under no conditions to adjust the apparatus.

This would lead to about the same results as if the trial case were to be entrusted to him for the selection of a glass.

The apparatus may either be held in the hand, or, what is far preferable, be mounted on a stand on the exact level of the patient's eye.

Before beginning the examination we should set the instrument at the zero-position, and so direct it toward the test-types that they may appear in the middle of the field. In testing the vision, any of the ordinary visual tests may be employed. One must see, however, that the lines are not too far apart, for, otherwise, the upper or lower lines will lie near the edge of the field and lose in distinctness, on account of spherical aberration.

As for the test-types, they are to be placed at a distance of at least 4 metres, in an inverted position and well illuminated.

When all these directions have been carried out, the patient is to cover one eye with the hand, and to look with the other through the instrument. The cornea of the patient must not be more than 5 *mm* distant from the aperture in the cap. This is generally attained by having the supraorbital region rest against the apparatus.

The patient is then asked to read the test-letters aloud, beginning with the largest. If he reads them all smoothly, he is either emmetropic or hyperopic, to decide which the instrument is fixed at + 1 D by means of the adjusting screw. If he still can read the same as before, it is altered to + 2 D, and so on. The highest positive adjustment with which he continues to read the same, gives the degree of hyperopia, measured with reference to the nodal point of the eye.

The acuteness of vision is shown directly by the number of the line read.

If, on the other hand, the patient does not read so well with the convex as with the zero-position, he is emmetropic.

If the patient is myopic and has been able to read, for example, as far as the third from the smallest line, we turn to the weak concave adjustments and try successively stronger negative adjustments till no further improvement of the vision results. The weakest negative adjustment with which it is possible to get this most distinct vision, gives the degree of the myopia.

The determination of the range of vision is equally simple.

The near point for emmetropes and myopes is given from the strongest negative adjustment with which it is possible to read without diminution of the visual acuteness. In hypermetropes we get it by trying successively weaker positive then stronger negative adjustments. The last adjustment at which the patient sees distinctly, determines the near point.[1]

Determination of Astigmatism.

If, instead of the spherical lenses, we employ in the apparatus two plano-convex cylindrical lenses of 5 *cm* focal distance, it can then replace all the cylindrical test-glasses. In this case, however, we must confine ourselves to the use of radiating lines or concentric circles for visual tests. The instrument must also admit of rotation on its long axis, to allow of the determination of the direction of the meridians.

We must then determine that adjustment of the apparatus with which the gray sectors disappear, and all looks equally sharp and black. Beyond this, the rules already given above are to be followed.

In the absence of the cylindrical lenses, it is yet possible to utilize the instrument in the determination of astigmatism, if we but provide the cap with a slit-shaped instead of the round aperture. The refraction of each meridian is then measured in the usual way.

Use of the Apparatus as a Refraction-Ophthalmoscope.

Let us imagine the background of the eye illuminated at the moment when the determination of the refraction with the instrument has been completed, and follow the course of the rays proceeding from the macula. We shall find that these intersect within the instrument, and after their final refraction converge to a point of the visual tests. Consequently, they leave the objective almost parallel.

If now an emmetropic observer places his eye before the objective, these rays will be brought to a focus on his retina, and he will obtain a distinct image of the background of the eye.

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[1] In this way, it is the relative and not the absolute range of accommodation that is determined.—K.

To illuminate the fundus of the eye, we remove the ordinary cap and attach another, bearing on its free extremity a mirror, which rotates on its vertical axis. This is used to throw into the eye of the individual examined the image of a flame which lies to one side.

It must be remembered that the mirror, the light, and the two eyes must be all in the same plane.

With the instrument mounted on a stand (an upright) it is quite easy to fix the fundus. The free-handed use of the apparatus requires more practice.

The picture one sees is an inverted one, formed by the ocular and viewed through the objective as with an ordinary magnifying glass.

As this lies some 45 *mm* deep in the tube, it is impossible at this end of the instrument to have the focus coincide with the nodal point of the eye. We cannot, therefore, aim at having a constant visual angle, but this in ophthalmoscopic work has no significance. It is very easy, however, to make the focus of the lens coincide with the principal point, or the anterior focus, of the eye: in the former case the eye is brought close to the opening; in the latter, it is kept some 13 *mm* distant.

After what we have said, the manipulation of the instrument should prove easy. The apparatus is so directed towards the eye under examination that the red reflex from the fundus becomes visible. The screen is now turned in the one or other direction until the details can be made out. For the more delicate adjustment, the same rules are to be followed as in the usual determination of refraction.

When the proper adjustment has been ascertained, the refraction of the eye under examination may be read directly from the instrument.

If the examiner is ametropic, the degree of his ametropia must be taken from the result, as the instrument gives the total of the examined and examining eyes. Instead of this, the observer may correct his ametropia previous to the examination. Fig. 8 shows the course of the rays when both eyes are emmetropic. The instrument is then adjusted to the zero-position.

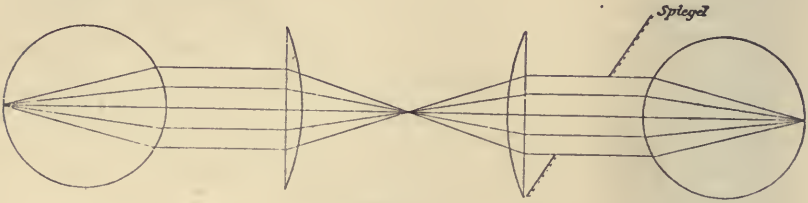

FIG. 8.

It would probably be advisable to adopt lenses of shorter focal distance in employing the instrument with the ophthalmoscopic mirror, on account of greater ease in handling.

We feel that we have already laid down sufficient proof that the instrument acts as a lens of adjustable focal distance for rays that are exactly or nearly parallel. The conditions are somewhat changed, however, when we have to deal with divergent rays, as, for example, in testing near vision. Although, as can be easily seen, it is possible to obtain with the apparatus rays of any degree of convergence or divergence, it is less adapted for testing near vision, because, first, there is an unavoidable enlargement of the test-types, which vitiates the results, and, secondly, a separate scale is required with each change in the distance of the tests.

On these grounds we would not for the present employ the apparatus for near objects. It is, further, entirely sufficient to know the far- and near-points of an eye in ordering any kind of spectacles.

The single or double instrument, with or without stand, may be procured from Schmidt & Haensch, Berlin, Stallschreiberstrasse 4.

SMALL ORBITAL OSTEOMA SUCCESSFULLY REMOVED WITH THE CHISEL.*

By H. KNAPP.

At the beginning of Dec. '87 a boy of thirteen years of age, L. G., of this city, was brought by his physician to the Dispensary of the New York Ophthalmic and Aural Institute, on account of a swelling in the inner-upper corner of the left orbit. This abnormity had been noticed for two months, caused no discomfort, but had been steadily increasing. Under the skin, just behind the orbital margin, at the inner-upper corner, I felt a tumor, the size of a cherry-stone, of marble hardness, slightly uneven surface, immovably connected with the roof of the orbit. On palpation, its posterior limit could be ascertained. The integrity and unrestricted mobility of the eyeball bore evidence to the absence of another growth deeper in the orbit.

I entertained no doubt about the osseous nature of the growth, but thought it possible that the tumor might proceed from the frontal sinus. Yet the perfect freedom from cerebral symptoms, *e. g.*, headache, fretfulness, irritability, or depression, as well as constriction at the base of the tumor, made it appear probable that the growth was limited to the orbit, and moreover that its base, as in the majority of tumors of this description, was cancellous. This supposition determined the plan of the operation.

Dec. 3, '87, under ether anæsthesia, a curved incision of 2 *cm* was carried through the skin and subcutaneous tissue down to the bone. The growth was explored with the finger. A second cut went through the periosteum, exceeding the whole length of the tumor by 2 *mm* on each side. The periosteum was detached from the tumor with a small gouge all around. The denuded osteoma was then grasped with a pair of tooth forceps, held by an assistant. A small straight chisel, the cutting edge of which was no more than 2–3 *mm* broad, was applied to the base of the tumor. During the hammering it was directed away from the growth, and obliquely toward the frontal sinus. The first strokes with the ox-hide mallet discovered the cancellous structure of the base, and it did not require many strokes to detach the little tumor, as a whole, like an unbroken cyst, from its surroundings. The frontal sinus had not been opened.

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* Read before the Ophthalmological and Otological Sections of the N. Y. Academy of Medicine. Feb., 1887.

When some bruised shreds of tissue had been cut off, and the hemorrhage was completely arrested, the whole round cavity was washed out with an alcoholic solution (Panas') of biniodide of mercury, and carefully closed with a continuous silk suture. The wound was covered with gauze and absorbent cotton, over which a flannel monoculus bandage was passed so as to exert gentle pressure and secure immobility of the eyelids. The patient was put to bed, had to lie quiet on his back, the other eye covered, except when he ate or had to satisfy calls of nature. I need not say that the operation was done under antiseptic precautions, with careful disinfection of the region of the wound, the instruments, hands, and sponges.

The result was recovery by primary union without any febrile disturbance. The skin of the region of the wound was not red, but a painless swelling of the subcutaneous tissue, limited to the previous seat of the tumor, could be felt for two or three weeks, then it completely disappeared. The suture was removed on the tenth day; it was perfectly clean, and no liquid oozed from its holes in the skin.

This was the easiest removal of any exostosis I have ever made. It confirms a lesson which I learned in previous cases, *i. e.*, never to delay operating an osteoma of the orbit or its neighboring cavities. These tumors, almost without exception, have a steady growth. It is commonly easy and harmless to remove them, as long as they are of limited size, say up to a large English walnut if their seat be the roof of the orbit or the frontal sinus, and more if they are located in the nasal passages or the malar antrum. When they have a large base at the roof of the orbit, or come out of the frontal sinus in a considerable mass, and in the course of years have caused exophthalmus or sloughing of the eyeball, or a portion of them can be felt under the skin above the eyebrow, near the root of the nose, their removal has invariably proved fatal, and I do not know whether modern surgery with all its antiseptic safeguards and its brilliant achievements, not to say results, in intracranial operations, would score many successes in such attempts.

In dealing with these tumors not only in the orbit but also in the ear canal, there is a rule upon which I have laid stress for years, and which our secretary, Dr. J. A. Andrews, has also emphasized in his exceedingly valuable and exhaustive paper on osteomas of the orbit and its neighboring cavities,[1] namely, not to attack those hard tumors at any point, but chisel them out of their connection by operating on their bases. The first example of such an operation is the famous case of Maisonneuve, which he called " subperiosteal removal." The osteoma in his case lay, however, more or less loose in the nasal passages, a common and favorable condition when these tumors occur in the pneumatic cavities around the orbit.

A very instructive, though not very satisfactory, case has just been published by Dr. Karl Grossmann, of Liverpool,[2] in which the patient refused the operation several years ago, and returned to the doctor only when the tumor in its growth had pressed forward and destroyed one eye, while a similar smaller growth, springing likewise from the inner-upper corner of the orbit, threatened the other eye. Dr. Grossmann, by long and tiresome drilling with a dental engine removed the projecting portion of the tumor, " as large as half a plum," and then another still flatter tumor which was behind the first. The operation lasted two hours and a half. The patient made a good recovery, and left the hospital on the twelfth day. A small drain had been left in the wound for more than six weeks, " but there was very little discharge, and the eye had very nearly resumed its normal position." A year later, when the patient was seen again, " the tumor seemed to have stopped growing. The exostosis in the other eye showed a very small increase in size."

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[1] *The Record*, 1887, p. 261.

[2] *Ophthalmic Review*, Dec., 1887, p. 341.

KERATITIS BULLOSA.

By C. W. TANGEMAN, Cincinnati, Ohio,

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THIS disease, though not of very frequent occurrence, has been described by a number of observers in the last century. Cases have been observed and reported from time to time, and the subject has received considerable attention, experimentally, at the hands of Prof. Leber, and yet the etiology of this disease is quite obscure. The scarcity of clinical material has made it difficult to study the affection with any degree of satisfaction. Experiments on the eyes of animals have yielded but few data, except to disprove the erroneous theory of Landesberg, who advanced the idea that the formation of vesicles on the cornea is purely mechanical, caused by a force from behind, as in increased intra-ocular pressure. It is now definitely fixed that, no matter how great the intra-ocular pressure, the fluid in the anterior chamber does not cause œdema of the cornea, or is not permitted to pass through the membrane of "Descemet" unless the surface be broken. In a large number of the reported cases of "keratitis bullosa" there was neither increased intra-ocular pressure nor inflammation of the uveal tract recorded.[1] Saemisch makes an infiltration of the parenchyma of the cornea the first stage in this disease. He says that all the difference there is between parenchymatous infiltration of the cornea and keratitis bullosa is that in the latter, some time during the course of the disease, there is a formation of large vesicles, larger than phlyctenular vesicles, and not so round or regular in shape. Graefe,[2] when making a microscopic examination of the anterior wall of the described vesicle, finds that not only the epithelial layer, but also the anterior elastic membrane and some fibres from the parenchymatous layer of the cornea, is separated to make up the covering of the vesicle. Possibly the smallest number of cases would show an involvement of the cornea to that depth. Usually, as Schweigger[1] states, he never *found* that more than the anterior epithelial layer was separated in this disease. Bullous keratitis must be differentiated from the various forms of vesicular keratitis or herpes cornea, which may occur without any previous inflammatory disturbance. It is safe to say that we have to deal with a separation of the superficial layer only in all of these various forms of inflammation ; the contents are the same, but the condition of the cornea and the circumstances under which each form is developed are different. Warlemont, McKenzie, and others have described this disease as dropsy of the cornea,—a formation of vesicles or blebs, due to an escape of fluid from the anterior chamber through the corneal tissue. While this theory has been disproven, nothing satisfactory has been substituted. Since a few cases have been reported of keratitis bullosa in glaucomatous eyes, the tendency has been to connect the etiology of the two diseases. Degenerative changes of the epithelial cells, causing an enlargement of the intercellular spaces, has most recently been advocated as the chief process that is going on in the corneal tissue, which looks so much like a parenchymatous inflammation of the cornea. Michel reports cases where he observed the formation of vesicles quite large on a cornea otherwise perfectly healthy.

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[1] Graefe and Saemisch: *Handb. d. Ges. Augenhk.*

[2] Graefe: *Arch. Ophth.*, ii., 1, 206.

The patient that came under the writer's observation at Prof. W. W. Seely's clinic is of special interest, since the vesicles appeared on both eyes simultaneously, and on an otherwise perfectly healthy cornea.

Mr. B., æt. thirty, laborer, white, robust and healthy, complained of a disturbance of his sight. Since the past week he had suffered acute attacks of pain, which seemed to get better one day and worse the next. A careful examination of his eyes showed three or four vesicles on each cornea, quite large, filled with a clear fluid. The patient said he had had previous attacks of a similar nature, and he had seen "blisters" form on the sight, that would pass away again. The cornea showed distinct traces of an apparently superficial abrasion. Aside from these changes nothing abnormal could be found about the cornea. The chief complaint was an intense burning sensation and some redness of the ocular conjunctiva. The tension was normal, and the depth and contents of the anterior chamber looked natural. The patient was not suffering from any constitutional affection, but gave a distinct malarial history or tendency.

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[1] Schweigger : Handbuch, 1873.

On the second day later, he presented himself again, and some new bullæ had formed. The patient was now put on large doses of quinine, with the effect of removing all symptoms of irritation, and preventing a recurrence of the vesicles on the cornea. The patient was kept under observation for some time, but there was not even a tendency to a return of the symptoms above recorded.

Here, now, we have a case of a rare disease, carefully watched, with an intermittent tendency, being absolutely cured upon the administration of an antiperiodic. Does this indicate any thing? Graefe, Schultze, Saemisch, and others have recorded cases with distinct periods of intermission, but fail to speak of the possibility of malaria having any etiological connection with this affection. In the above case all of the diseases usually given as causative of vesicular keratitis, viz., glaucoma, iritis, ichthyosis, inflammation of the uveal tract, degeneration of the corneal epithelium, corneal infiltration and enlargement of the intercellular spaces, engorgement of the lymph spaces, increased intra-ocular pressure, or a mechanical force, were absent. Hansen some time since described a case of intermittent vesicular keratitis, but insists that it was caused by trauma to the corneal epithelium.

How these vesicles should occur on the cornea due to malaria is difficult to say, yet it would be no more impossible than when they follow vaso-motor disturbances (Michel), or when we have a serous effusion into the vitreous (Seely[1]), or, finally, in the case reported by Perlia,[2] where the formation of the vesicles was due to vaso-motor changes[6] caused by migraine.

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[1] Transactions of the Amer. Ophth. Soc., 1883.

[2] Zehender: *Monats. Bl.*, 1888.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE SECOND QUARTER OF THE YEAR 1887.

By H. MAGNUS, Breslau ; C. HORSTMANN, Berlin ; and
A. NIEDEN, Bochum.

WITH THE CO-OPERATION OF

C. E. Fitzgerald, Dublin ; E. Marckwort, Antwerp ; P. von Mittelstädt, Metz ; Dantone, Rome ; Hirschmann, Charkow ; S. M. Burnett, Washington ; Schjötz and Ole Bull, Christiania, etc.

Sections I.–V. Reviewed by Prof. H. MAGNUS.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

142. Barkan. Expert medical report on 158 inmates of the Institution for the Deaf and Dumb and Blind, at Berkeley. *Trans. of the Med. Soc. of the State of California for the years* 1886–1887.

Barkan (142) finds that in 36 cases of binocular blindness, the following affections were the cause : blennorrhœa neonatorum in 25 %, congenital blindness in 22.22 %, cerebral affections in 11.11 %, unknown affections in 11.11 %, conjunctivitis granulosa in 8.33 %, spinal meningitis in 2.77 %, malaria in 2.77 %, small-pox in 2.77 %, rheumatism in 2.77 %, syphilis in 2.77 %, toxic influences in 2.77 %. In regard to the health of the members of the family to which the blind belonged, Barkan makes the following statement : Father and mother insane, 1 case ; sister blind, 2 cases ; brother deaf and dumb, 2 cases ; brother and sister paralyzed, 1 case ; related in the third degree, 1 case.

b.—STATISTICAL PAPERS.

143. EYE AND EAR CLINIC OF THE MIAMI MED. COLLEGE, Cincinnati, 1887.

144. PFLÜGER. Ophthalmic clinic of Berne University. Report for the years 1884–1886.

145. SCHREIBER. Fourth annual report for the year 1886. Magdeburg, 1887.

146. UTRECHT. Nederlandsch Gasthuis voor behoeftige en minvermogende voglijders. *Acht-en-Pwintigste*, Verslag 6, Juni, 1887.

At the MIAMI COLLEGE EYE CLINIC (143) 970 cases were seen. Operations: 2 extractions, 7 iridectomies, 2 enucleations.

BURNETT.

PFLÜGER (144) treated, from 1884 to 1886, 3,201 patients in the dispensary, and admitted 1,202 into the clinic. Operations upon the lens, 142—132 with good, 5 with moderate result, 5 failures. Total number of operations performed, 887.

SCHREIBER (145) treated 1,594 patients, and admitted 148 into the clinic. Number of linear extractions, 14, thirteen of them with good result, one failure; 8 extractions, 19 extirpations of the lachrymal sac.

In UTRECHT (146), 2,777 patients were treated.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

a.—GENERAL PATHOLOGY.

147. JAVAL. Sur l'ophthalmométrie pratique. *Soc. franç.*, May, 1887.

According to JAVAL (147), there are three kinds of corneal astigmatism. 1. The vertical meridian has the smallest radius of curvature; this is the most frequent kind. 2. The horizontal meridian has the smallest radius of curvature. 3. The principal meridian is inclined at an angle of 45°. In cases of the first sort the corneal astigmatism of young persons is usually corrected by astigmatic contraction of the lens; in cases of the second sort the corneal astigmatism is generally more than doubly corrected by astigmatic accommodation; this is the most frequent cause of complaint of astigmatic persons. In cases of the third sort we must endeavor to find the axis of the glasses which correct the decentration of the eye. Javal recognizes only that determination of the astigmatism which is made with Javal-Schjötz's ophthalmometer, wherein he is opposed by Wecker. MARCKWORT.

b.—GENERAL DIAGNOSIS.

148. BOUCHERON. Sur la notation horaire de l'astigmatisme. *Soc. franç. d'ophth.*, May 2, 1887.

149. BULL, GEO. J. Optometrie rapide. *Soc. franç. d'ophth.*, May 2, 1887.

150. CUIGNET. Images kératoscopiques. *Rec. d'ophth.*, 1887, No. 5.

151. TSCHERNING. Ophthalmométrie. *Soc. franç. d'ophth.*, May 2, 1887. Simplification of Javal's ophthalmometer.

152. ZIENINSKI. De la détermination du degré de l'amétropie par la rétinoscopie. *Rec. d'ophth.*, 1887, No. 5.

ZIENINSKI (152) recommends retinoscopy for the objective determination of refraction, a method which thus far has received a different name from almost every author. Cuignet, the inventor of this method, calls it keratoscopy; Galezowski, dioptroscopy; Landolt, pupilloscopy; Parent, retiniscopy; Chibret, sciascopy; and Zieninski the above-mentioned name. The method is based on the varying displacement of light and shadow on the retina in the different kinds of refraction, the source of light being a plane or concave mirror. In England and America this method has found adherents, but not in Germany, while in France, where it was invented, it seems to be practised by only a few oculists.

c.—GENERAL THERAPEUTICS.

153. GAYET. Asepsie oculaire. *Soc. franc. d'ophth.*, May 4, 1887.

154. KLEIN. Remarks on the formation of a pupil for optical purposes. *Centralbl. f. d. ges. Therapie*, 1.

155. SEGAL. On exenteration of the globe. *Protokolle d. Kaukasischen med. Gesellsch.*, 1887, No. 14.

156. STOCKER. On the influence of mydriatics and myotics on the intraocular pressure under physiological conditions. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 1, p. 104.

GAYET (153) took the conjunctival secretion from all his patients (102) for a month and made cultures. In 79 cases he obtained a positive result, though the conjunctival sac had previously been washed out twice daily. He found staphylococcus aurens and albus. Nevertheless, the operations performed on this infected territory gave good results, and Gayet asks why infection did not take place. Probably every thing that causes a movement of liquid into the eye from without favors infection. The method of operating, therefore, very likely has a great influence on the development of infection. MARCKWORT.

KLEIN (154) defends the iridectomy for optical purposes in zonular cataract.

HOLBECK performed exenteration of the eyeball in conjunction with SEGAL (155) in 7 cases of chronic iridocyclitis and panophthalmitis of traumatic origin. The course of healing was favorable in all, its duration two to three weeks; the reaction was very slight. The stump was freely movable and well adapted for wearing an artificial eye. Segal, therefore, would confine the indications for enucleation to tuberculous affections or neoplasms of the eye. In all other cases he would prefer exenteration.

HIRSCHMANN.

STOCKER (156) found that in animals under the influence of curare atropine slowly diminishes the intraocular pressure under physiological conditions. Cocaine also reduces the intraocular pressure about 2 to 3 *mm*, preceded in the majority of cases by a slight increase. Eserine primarily increases the pressure in the physiological eye; there is no primary reduction of the tension. The increase is followed by a reduction greater than the primary increase. Pilocarpine slowly reduces the tension in the physiological eye, after previously disturbing it for half an hour, accompanied with general excitement. During the period of varying pressure there is an increase of the mean tension in both eyes. Stocker, therefore, comes to the following conclusions: the action of the pupil stands in no causal connection with the increase or decrease of the intraocular pressure.

III.—INSTRUMENTS AND REMEDIES.

157. VALK, F. An improved ophthalmoscope. *N. Y. Med. Rec.*, April 23, 1887.

VALK'S (157) improvement consists in an arrangement by which the disc of lenses can be turned by means of a button which is moved up and down on the handle of the instrument (devised by de Wecker 16 years ago. Ger. re.). BURNETT.

158. BONO. Della coffeina come analgesico locale in oculistica. *Ann. di ottalm.*, vol. xvi., 1.

159. MAKLAKOFF. Notice sur la valeur du péroxide d'hydro-

gène comme remède thérapeutique et diagnostique. *Arch. d'ophth.*, No. 3.

According to the investigations of Bono (158) coffeine is a very effective analgesiac. It does not produce anæsthesia in the strict meaning of the word, but soon causes the pain to cease produced by instruments and caustics, not only on the cornea and conjunctiva, or other mucous membranes, but also on the cutis. A 2 % solution suffices. Dantone.

Maklakoff (159) highly values the peroxide of hydrogen, especially because the nascent oxygen penetrates into the interstices of the tissue so that the remedy may be regarded, so to speak, as an interstitial antiseptic. When, after the removal of a foreign body, the author dropped some peroxide of hydrogen upon the corneal wound, the picture of a hypopyon at once appeared, connected with an ulcer by a thin white line. The phenomenon was caused by the entrance of the oxygen in form of minute bubbles into the corneal tissue, soon disappeared, and could be easily reproduced. As the remedy thus reveals small superficial defects of tissue, the author considers it of diagnostic value also. Since he has used it in serpent corneal ulcers, he asserts that he has not been obliged to resort to Saemisch's operation even in the most desperate cases, and refers for his results to statistics which are to appear later. v. Mittelstädt.

IV.—ANATOMY.

a.—GENERAL AND COMPARATIVE ANATOMY.

160. Haensell. Méthode pour conserver les préparations macroscopiques du bulbe oculaire. *Bull. de la clin.-ophth. nat. de l'hosp. des quinze-vingts*, vol. v., No. 2, p. 79.

161. Lebejden. Cystoid coloboma. *Wjestnik ophth.*, vol. iv., No. 3.

162. Stöhr. Handbook of histology and microscopic anatomy of man, including microscopic technique. Jena, 1887.

Haensell (160) embeds sections of the eyes for preservation in glycerine-glue, according to the method of Nettleship and Priestley Smith. This glue the author prepares according to the directions of Gerlach. After adding albumen, boiling and filtering, the mass, which previously had been turbid, becomes clear and gradually solidifies. For the detailed directions for preparing and embedding, see the original.

Lebejden (161) describes a case of bilateral anophthalmus with the well-known cysts under the lower lids in a child a year and a half old.

Stöhr (162) presents in the tenth chapter of his book a short but very instructive account of the histology of the eye, with directions for preparing microscopic specimens of the various parts. The reviewer has found the book very useful and earnestly recommends it.

163. Jessop, Walter H. Abstracts of lectures on the intraocular muscles of mammals and birds. *Ophth. Rev.*, May–June, 1887.

Jessop (163) denies the existence of a dilator of the pupil. According to him the division of the ciliary muscle into longitudinal, radiating, and circular fibres, first advanced by Iwanow, cannot be strictly maintained, the direction of the fibres being dependent upon the shape of the eyeball and the position of the ciliary body.

b.—ORBIT.

164. Ellis, F. W. The circulation of the blood in the orbit studied by means of the plethysmograph. *Boston Med. and Surg. Jour.*, April 21, 1887.

Ellis (164) has designed an instrument, which he calls the plethysmograph, by means of which he can measure the pulse-curves with the greatest delicacy. He has determined by means of this apparatus that the pulse-curve of the orbit is the same as that of the brain. Burnett.

c.—CENTRAL ORGAN.

165. Forel. Some reflections and conclusions on the anatomy of the brain. *Arch. f. Psych.*, vol. xviii., p. 162:

Forel (165) thinks that the optic fibres ramify in the corpus geniculatum externum, where they end, and that here a new system of fibres takes its origin in the ganglion-cells and terminates in the visual sphere.

V.—PHYSIOLOGY.

a.—GENERAL PHYSIOLOGY.

166. Andrews. The electric light as an illuminator. The effect of strong light on the eye. *Trans. Amer. Ophth. Soc.*, vol. xxii., annual meeting.

167. FIEUZAL. Les verres gris-jeunes et les mouvements des éléments rétiniens. *Bull. de la clin.-nat. ophth. de l'hosp. des quinze-vingts*, No. 2, 1887.

168. HOLDEN. Simple methods of finding the axis of a prism. *Amer. Journ. Ophth.*, May, 1887.

ANDREWS (166) considers the arc-light injurious, the incandescent, however, the ideal light.

More than seven years ago FIEUZAL (167) prescribed yellow glasses instead of blue or smoke glasses in cases of photophobia and hyperæsthesia of the retina, and always found that the patients preferred the former. Fieuzal has now had made grayish-yellow glasses (a mixture of yellow, blue, and gray), which he claims satisfy all the demands of the hygiene of the eye. The physiological explanation of their action is found in the investigation of van Genderen Stort on the changes in position after illumination of the elements of the visual layer, according to which yellow light does not influence the cones, their position remaining unchanged, while green light provokes the most extensive movements. The author recommends these glasses, which can also be used in form of spherical or cylindrical glasses or goggles, in all cases of retinitis, choroiditis, and photophobia, but also as a protection against bright sunlight. Green glasses should be avoided, but might be indicated in cases of torpor of the retina.

v. MITTELSTÄDT.

HOLDEN (168) turns the prism until both of the images of a degree are united in one unbroken line; this line indicates the direction of the axis of the prism.

b.—RETINA.

169. HERING. On the theory of simultaneous contrast of Helmholtz. First communication. The experiment with the colored shadows. *Arch. f. d. ges. Physiol.*, 1887.

170. TREITEL. On the nature of the disturbance of the sense of light. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 1, p. 31.

171. TREITEL. On normal adaptation, *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 73.

172. WERTHEIM. On the number of visual unities in the middle portion of the retina.

HERING (169) thinks that the phenomenon of simultaneous contrast need not be explained on a physiological basis, but may be considered as due to alternating action of the portions of the retina affected.

TREITEL (170) shows that Wolffberg has not determined an anomaly of the cause of light with his method, but only that functional disturbance which is the essential feature of hemeralopia. We can only speak of a diminution of the sense of light, when the power to recognize difference in brightness has been impaired. Hemeralopia, however, is an affection in which all the functions of the sense of sight, those of space, color, and light, have been pathologically diminished, the absolute illumination being reduced.

c.—COLOR-PERCEPTION.

173. DOBROWOLSKY. On the causes of erythropsia. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 213.

174. HOOR. Tests for color-blindness in the royal army and navy. *Militärarzt*, 1887, Nos. 10 and 11.

175. HOOR. The quantitative test of color-perception of Dr. Louis Wolffberg. *Militärarzt*, 1887, No. 7.

176. RUDALL. Color-blindness and other defects of sight in some of their medico-legal aspects. Melbourne, 1887.

DOBROWOLSKY (173) found that the maximum dilatation of the pupil is necessary to produce the phenomena of erythropsia in the whole field of vision, or its greater portion. In an eye with narrow pupil, erythropsia can only be produced with certainty when the sun is gazed at. But even in this case, the erythropsia is confined to the point of fixation and its immediate neighborhood. This difference is explained by the fact that when the pupil is dilated the light can spread itself over the entire retina, or the greater part of it, while when the pupil is narrow only a sharply defined image of the sun is formed. Dobrowolsky also noticed "violet seeing" during his experiments, and explains it by saying that it is the negative after-image of those rays which come from the edge of the sun, and are dispersed over the fundus. It would therefore be more correct to substitute for erythropsia the more appropriate expression, "violet seeing."

HOOR (174) recommends Stilling's plates, but is not satisfied with having them read, but also asks the patient to point out the letters.

HOOR (175) has found that Wolffberg's method has but limited value for the military physician, and that the question of fitness or unfitness for service cannot be accurately determined by it.

d.—MISCELLANEOUS.

177. LANGENDORFF. On monocular and binocular closure of the lids. *Arch. f. Anat. u. Physiol.*, 1887, p. 144.

LANGENDORFF (177) found both the pupillary and the blinking reflex confined to one eye in the rabbit, while in man both eyes were always affected. This depends upon the incongruity of the visual field in the divergent eyes of the rabbit, while in man the visual fields coincide. There must, therefore, be intercentral fibres in man of the facial nerve, which controls the closure of the lids, connecting the visual centres in the cortex. In the rabbit there are probably no such fibres.

178. STEINACH. Studies on the comparative physiology of the reaction of the pupil. *Centralbl. f. Physiol.*, 1887, No. 5. Animals with partial decussation in the chiasma possess direct and consensual reaction of the pupil. In animals with total decussation, the pupillary reflex is confined to the eye examined.

Sections VI.–X. Reviewed by DR. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

179. COHN, H. Medical supervision of the schools for preventing the spread of myopia. Rev. fr. the vi. internat. hygienic Cong. at Vienna. Vienna, 1887.

180. COLEMAN, W. F. The use of a convex cylinder in simple myopic astigmatism of low degree. *Jour. Am. Med. Ass'n*, May 28, 1887.

181. JAVAL, PARENT, MARTIN. Notation de l'astigmatisme. *Soc. franç. d'ophth.*, 1887.

182. MARTIN, G. Croissants de la pápille et contractions astigmatiques. *Ann. d'ocul.*, vol. xcvii., p. 166.

183. RANNEY, AMBROSE L. Eye-strain in its relation to neurology. *N. Y. Med. Jour.*, April 16, 1887.

184. STILLING, J. Investigations on the development of myopia. Wiesbaden, 1887. J. F. Bergmann.

185. VESZELY, CARL CONSTANTINE. The genesis of myopia. *Wiener med. Wochenschr.*, 1887, No. 35.

According to COHN (179), myopia increases from one grade of school to the other, in proportion to the increased demands upon the eye. It should not be treated with indifference, and strict measures should be adopted to prevent it. In the majority of cases it is caused or at least increased by long-continued near-work, especially under poor illumination. It is particularly incumbent upon the school to avoid every thing which may contribute to the development of myopia. Special attention should be given to the illumination, the construction of the benches, the print of the school-books, to the writing and the blackboard, to the wearing of glasses, and the overtaxing of the eyes. It is desirable that a physician should examine the sight and refraction of every child on admission, this examination to be repeated at the beginning of each term.

COLEMAN (180) recommends the use of a convex cylinder with its axis at right angles to that of the correcting concave glass, for near vision. The very evident propriety of this procedure in certain cases in which it is desired to relieve the accommodation, and the great frequency with which it is done, would, it seems, render a special article on the subject unnecessary. BURNETT.

On May 2, 1887, a commission was appointed by the Société française d'ophthalmologie for the purpose of devising some uniform system of notation of astigmatism, cylindrical glasses, optometer, etc. In the report of the commission PARENT (181) proposes for both eyes an identical, not symmetrical, notation, by determining the trial-glass for the patient in the direct sense, *i. e.*, that the zero-point should be situated on the right hand of the patient when the scale is on the lower half of the frame, and on the left of the patient when it is on the upper half. Landolt does not agree with the commission, but suggests a symmetrical notation, by placing the zero-point on the median line and then counting to the left and right. The addition of the letter "n" indicates an inclination of the upper end of the meridian to the nasal side, the letter "t" an inclination to the temporal side. Landolt and Meyer are therefore added to the first commission, but as no agreement can be reached between Javal, Parent, and Martin on one side and Landolt and Meyer on the other, a definite decision is postponed until next year. The method recommended by Javal, Martin, and Parent agrees with the American, and that of Landolt and Meyer was recommended by Knapp years ago (see these ARCH., vol. XV., p. 209). MARCKWORT.

MARTIN (182) endeavors to show that the posterior staphyloma is the result of the astigmatic contractions of the ciliary muscle. The direction of the crescent is always parallel to one of the principal meridians, generally the one of least curvature. Among 358 cases of astigmatism according to the rule (vertical), Martin found 336 external and only 22 lower crescents. Among 24 cases of astigmatism contrary to the rule (horizontal), all had vertical crescents. Among 22 cases of oblique astigmatism, there were 15 perpendicular and in 7 crescents parallel to the corneal astigmatism. Among the whole number of 413 cases, the crescent was therefore parallel in 384 to the astigmatic contraction of the ciliary muscle, *i. e.*, in 93 per cent. of all cases. (The hypothesis is refuted by the author's own numbers.—K.) MARCKWORT.

RANNEY (183) has been making partial tenotomies of the ocular muscles, after the method of Stevens, for two years, in cases of nervous disease where insufficiencies were found. He is enthusiastic in its praise, and asserts that many cases of epilepsy, neurasthenia, neuralgia, chorea, and hystero-epilepsy have been relieved by the procedure. BURNETT.

STILLING (184) has tried to bring the question of the genesis of myopia nearer to its solution, both from the anatomical as well as from a clinical point of view. After discussing the various theories, he first gives an anatomical examination of the eye, considering, especially, the superior oblique muscle and its action. From a further series of fifty cases Stilling shows that the action of the muscles has a marked influence on the shape of the eyeball. In this respect the superior oblique plays an important part, as its course and insertion is very variable, that of the other muscles very constant. The development of the crescent is due to the action of the superior oblique, increased by that of the recti muscles, and the prolongation of the globe or increased curvature of the cornea respectively is also due to the action of the muscles. Stilling has also subjected 10 myopic eyes to a careful examination; in 6 of them an orbital section could also be obtained. The refraction of 7 of these during life was known (5 had a myopia of 10 D or more, 2 of 5 D). The antero-posterior diameter of the eyes with a moderate degree of myopia, either did not differ from that of the normal eye, or at least did not exceed it by more than 1½ *mm.* The temporal portion, however, was larger than the nasal; the sclera had not become thinner. The highly myopic eyes were enlarged in every diameter, without exception. In some the nasal, in others the temporal portion was the larger. In the former, the superior oblique extended diagonally or straight across far over on the temporal side; in the latter, the tendon did not reach beyond the median line. The sclera had become thinner, the vitreous was more or less destroyed, the sheath detached from the optic nerve, the intervaginal space dilated, and the papilla displaced. The choroid had undergone extensive changes, the pigment had disappeared from large areas, not only in the pigment-layer, but also in the stroma; the layer of rods and cones had become atrophic around the papilla, also the two granular layers.

There are therefore two anatomically distinct forms of myopia; the one being essentially a change in the form of the otherwise normal eyeball, with a normal or only slightly elongated axis, a normal sclera, a normal intervaginal space and vitreous; the other showing a marked distension of the whole eyeball, causing atrophy of the choroid, and adhesion between the latter and the retina and sclera around the optic nerve. The papilla is not only displaced, but also somewhat pulled apart and thereby enlarged. The two forms of myopia have only the kind of refraction, the shape of the ciliary muscle, and the crescentic form of the conus in common. The one is due to slightly increased longitudinal growth under muscular pressure, the other to a dropsical degeneration of the eye. The ordinary crescentric conus is of no pathognomonic value, but the opposite is true of the large ring-shaped one. The former belongs to the first form, the latter to the second. The former can be produced by near-work, the latter is a disease of the eye. The former is not followed by the evil consequences many hygienists assume. It is a harmless deformity, which does not materially affect the function of the eye.

The last chapters contain historical remarks on myopia and concave glasses.

VESZELY (185) also asserts that the superior oblique plays an important part in the development of myopia.

VII.—LIDS.

186. BENSON, A. The operative treatment of trichiasis, with or without entropion, and a short note of Argyll Robertson's operation for ectropion. *Brit. Med. Jour.*, 1887, No. 1,378.

187. HOLMES, E. L. Chancre of the eyelid. *Jour. Am. Med. Assoc.*, April 23, 1887.

188. MCKEOWN. Spasmodic entropion. New method of treatment. *Brit. Med. Jour.*, 1887, No. 1,378.

189. TRÉLAT. Ectropion cicatriciel, autoplastic. *Rec. d'ophth.*, 1887, No. 4, p. 193.

Benson (186) recommends the operation according to Argyll Robertson.

Holmes (187) reports one case in which a man received a burn on the eyelid, which subsequently, in some manner unexplained, became infected. The ulcer, as well as the general symptoms, disappeared promptly under specific treatment. **Burnett.**

To overcome spastic entropium of the lower lid, **McKeown** (188) passes a suture through the middle of both commissures, allowing them to remain six days in position, and keeping the edges of the lids in contact for that length of time.

VIII.—MUSCLES AND NERVES.

190. **Amidon.** Two cases of insufficiency of the superior rectus muscle, with distressing symptoms permanently relieved by prisms. *N. Y. Med. Rec.*, April 23, 1887.

191. **Chisolm, J.** Congenital paralysis of the sixth and seventh pair of nerves in an adult. *Arch. f. Augenhk.*, vol. xvii., p. 414.

192. **Rampoldi.** Assenza congenita ereditaria dei movimenti oculo-palpebrale. *Ann. di ottalm.*, vol. xvi., 1, p. 51.

In both of **Amidon's** (190) cases there was at first observation insufficiency of the interni, and the deficiency of the superior rectus was not discerned until later. There were in both cases severe nervous symptoms, pain, vertigo, vomiting, etc. One was relieved by a prism of 3° base in over the right eye and 2° base up over the left eye, in conjunction with a correction of the presbyopia. The other case, an astigmatic, was relieved by placing the prisms obliquely, thereby correcting both the inward and upward deficiency, 4°, 160°. **Burnett.**

Rampoldi (192) saw in a brother and sister complete absence of the movements of the eyes combined with ptosis. In the young man the eyes and sight were normal, but in the girl vision was poor ; the field, however, intact. The ophthalmoscope revealed a physiological excavation and a lateral exit of the blood-vessels from the papilla. The condition was congenital, and the father was similarly affected. **Dantone.**

IX.—ORBIT AND NEIGHBORING CAVITIES.

193. **Baasner, N.** Case of fracture of the medial wall of the orbit and of the ethmoid cells. *Münchener med. Wochenschr.*, 1887, No. 18.

194. Bettman, Boerne. Ocular troubles of nasal origin. *Jour. Amer. Med. Assoc.*, May 7, 1887.

195. Jeffery, G. C. An anomalous experience during the enucleation of an eye ball. *N. Y. Med. Times*, April, 1887.

196. Swanzy, H. R. A case of fibro-sarcoma of the orbit. *Ophth. Rev.*, 1887, vol. vi., No. 69, p. 185.

197. Zehender, W. A case of echinococcus in the orbit, with remarks on the occurrence of this disease in Mecklenburg. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 333.

198. Ziem. Disturbance of sight after application of the galvano-cautery in the nasal cavity. *Centralbl. f. prakt. Augenhk.*, 1887, p. 131.

Baasner's (193) case was that of a man aged 42, who had been injured about the head in 1871. Five years later, exophthalmus of the right eye with diplopia developed, which increased from year to year. At the inner canthus a tumor became visible. After incision a defect of the medial wall of the orbit and a loose piece of bone were discovered. The latter was removed and drainage-tubes were inserted, whereupon the exophthalmus gradually disappeared.

Bettman (194) reports six cases of epiphora with attendant conjunctivitis accompanying nasal troubles,—hypertrophy of the turbinated bones, polypi, etc.,—which were completely relieved by a removal of the nasal trouble. Burnett.

In Jeffery's (195) case the whole orbital tissue and lids became infiltrated with blood after the section of the nerve in enucleating an atrophied globe. Such an accident has happened to the reporter, but they seem to be very rare. Burnett.

Swanzy (196) removed a fibro-sarcoma which filled the whole of the left orbit, and had been gradually growing for four and a half years. The eyeball was dislocated upwards under the stretched and enlarged upper lid. The tumor was removed without difficulty, and the boy made a good recovery. The microscopic examination showed a predominance of the fibrous over the sarcomatous structure. Fitzgerald.

Zehender (197) extirpated in three sittings an echinoccocus from the orbit of a man aged 38. It had caused exophthalmus and diplopia; the former condition disappeared after the operation, while the latter improved.

Ziem (198) observed in three cases temporary disturbances of vision after cauterization of the nasal mucous membrane. Ophthalmoscopically nothing abnormal.

X.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

199. DE BENEDETTI. La profilassi della blenorrhœa congiuntivale dei neonati. *Boll. d'ocul.*, vol. ix., 8–9, p. 65.

200. BENSON, A. Cases of tumor of conjunctiva and cornea. *Ophth. Rev.*, 1887, vol. vi., No. 69, p. 189.

201. BONO. Un nuovo metodo operativo per corregere molti casi di simblefaro. *Ann. di ottalm.*, vol. xvi., 1, p. 46.

202. COPPEZ. Ophthalmie diphthéritique chez un enfant de dix jours. *Soc. franç. d'ophth.*, 1887.

203. GAYET. Ophthalmia neonatorum. *Prog. méd.*, 1887, No. 23.

204. KARWETZKY. The question of the fight against trachoma among the military. *Russkaya Med.*, 1887, No. 21.

205. KUCHARSKY, J. Bacteriological remarks on trachoma. *Centralbl. f prakt. Augenhk.*, 1887, p. 225.

206. LOPEZ. Note sur le ptérygion. *Rec. d'ophth.*, 1887, No. 4, p. 223.

207. MOURUAN. Traitement du trachome conjunctival par la cauterisation. *Thèse de Paris*, 1887.

208. RAEHLMANN. The etiological connection between pannus and trachoma. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 113.

209. SCELLINGO. Sarcoma melanotico della congiuntiva. *Boll. d. R. Accad. med. di Roma*, vol. xiii., 5.

210. SCHMIDT, E. The micro-organisms of trachoma and some other mycotic diseases of the conjunctiva. *Inaug. Diss.*, St. Petersburg 1887.

211. WEEKS, J. E. The pathogenic microbe of acute catarrhal conjunctivitis. *N. Y. Med. Rec.*, May 21, 1887.

BENSON (200) describes a case of recurrence of fibroma of the cornea, which was much smaller and flatter than the original tumor. He also removed a melanotic growth from the conjunctiva close to the corneal margin, which was 8 *mm* long and 3 *mm* wide.

In operating for symblepharon, BONO (201) divides the adhesions as usual, detaches the conjunctiva, reunites the wound in the lids, but in closing the wound on the globe does not cut one of the threads of the last suture in the fornix, but passes it through the lid to the outer surface, draws it tight, and in symblepharon of the upper lid fastens it on the cheek, of the lower lid, to the brow. The raw surfaces opposite each other, which may still exist, are thus kept apart, thereby diminishing the probability of reuniting. DANTONE.

COPPEZ (202) reports a case of genuine diphtheritic conjunctivitis in a child 10 days old, and advises the use of citric acid as recommended by Fieuzal. MARCKWORT.

GAYET (203) discusses blennorrhœa neonatorum, the cause of which he finds in Neisser's gonococcus, which enters the eye during the passage of the head through the vulva.

KARWETZKY (204) warmly recommends pressing out the trachoma-granules, followed by an irrigation with a solution of corrosive sublimate. He presses out the granules partly with the fingers, partly with a forceps. HIRSCHMANN.

According to the investigations of KUCHARSKY (205), trachoma is an affection of the conjunctiva sui generis, as the same micro-organisms occur in the granules with special biological and morphological differences. The pathogenic qualities of these micro-organisms have, however, not yet been demonstrated. The micro-organism found by Michel, which morphologically consists of micrococci, possesses nothing characteristic. The coccus found by the author in the trachoma-granule grows on solid nutrient soil at a temperature of 30–35° C. in shape of white readily confluent spots, which form a membrane which can be drawn out in threads; meat peptone-gelatine is always liquefied. By transferring this culture to pigeons, rabbits, cats, dogs, and man, true trachoma could not be produced, but by transferring the contents of the trachoma-granule to the conjunctiva of the cat, granulations similar to those of trachoma developed. Trachoma and follicular catarrh are identical processes from a bacteriological point of view.

LOPEZ (206) observed 9.29 % of pterygium among all his eye-patients on Cuba. The whites seemed most disposed to this disease. MARCKWORT.

According to RAEHLMANN (208) pannus in trachoma is neither of traumatic origin, nor does it pass to the cornea from the mucous membrane of the lids and globe over the limbus. It is an independent disease, which in the majority of cases coincides with trachomatous conjunctivitis; it manifests itself as a peculiar localization of trachoma on the cornea.

SCELLINGO (209) removed from a person aged 33 a melanotic sarcoma the size of a pea, which had developed on the tarsus of the left upper lid. DANTONE.

SCHMIDT'S (210) dissertation contains a more detailed exposition of the paper of the reviewer on the trachoma-coccus previously published and herein reviewed, besides new investigations on the microbes found in epidemic catarrh, phlyctenular conjunctivitis, blennorrhœa of the new-born and adults, croupous and diphtheritic conjunctivitis, and those found on the normal conjunctiva. In regard to the trachoma-coccus, the author comes to the following conclusions: 1. Trachoma is a mycotic disease. 2. The trachoma-coccus of the author seems to be identical with that of Sattler. Michel, on the contrary, has not examined a pure trachoma form, but probably one combined with blennorrhœa. 3. In shape and position, the trachoma-coccus greatly resembles the staphylococcus pyogenes, from which it differs (*a*) by its greater size, (*b*) lesser mobility, (*c*) greater tenacity of the cultures, which liquefy gelatine but slowly. The trachoma-cocci are sometimes arranged in chains. 4. The development of cultures on blood-serum and agar-agar is indicated by the appearance of gray or milk-white spots of viscid consistence, which appear in shape of foci along the track of the infecting needle. 5. The cultures grow much more rapidly at a temperature of 36°–38° C. 6. In birds (pigeons) it is easy to produce trachoma from cultures of the coccus. In mammals the infection succeeds only after several attempts repeated at longer intervals. 7. The trachoma-cocci can be found in all the layers of the conjunctiva, as well as the subconjunctival tissue. Epidemic catarrh is due, according to the author, to the presence in the conjunctival sac of a pathogenic micro-organism, which in shape and manner of growth is identical with the staphylococcus pyogenes albus. It does not seem to penetrate into the depths of the tissues. In phlyctenular conjunctivitis, Schmidt was able to cultivate five different varieties of microbes. The results of inoculations with them were negative. In blennorrhœa he found Neisser's gonococci characteristically embedded in the protoplasm of the cells. But in the cultures, the gonococcus loses its characteristic form and size, and may then easily be mistaken for other diplococci, as Bumm mentions (the smaller ones resemble the trachoma-cocci, the larger ones the sarcinoids). The gonococcus can be most easily (perhaps even exclusively) cultivated on blood-serum. In the cultures it is soon destroyed by other micro-organisms. In croupous conjunctivitis, Schmidt found whole groups of diplococci in the protoplasm of the pus cells and around the nuclei of destroyed cells. When stained with gentian-violet they can be recognized with great distinctness, while vesuvine tinges them but slightly. In size they correspond to large gonococci, but the characteristic flattening of each half was absent. They could not be cultivated. Based on investigations of himself and others, the author ascribes xerosis of the conjunctiva to the entrance and proliferation of a specific bacillus in the superficial epithelial layer. The affection may also spread to the cornea, at least in adults. This bacillus of xerosis has two vegetative forms : that of the bacilli and that of the cocci. The author did not succeed in observing the change from cocci to bacilli. That the cocci were derived from the bacilli was clearly shown by cultures. Inoculations did not succeed.

The author mentions also the following, not pathogenic forms of micro-organisms, which he found in the secretion of diseased as well as healthy conjunctivæ : lemon-colored sarcina, two forms of bacilli, micrococcus prodigiosus, white sarcina, staphylococcus flavus. Experiments on the influence of several antiseptic substances in common use on the vitality of these pathogenic micro-organisms gave the following results : a solution of sublimate, 1:8,000 (possibly weaker ones also), a two-per-cent. solution of carbolic acid, iodoform in a ten-per-cent. glycerine-emulsion, kill all the pathogenic microbes described by the author in five minutes. A one-per-cent. solution of carbolic acid has the same effect on all pathogenic forms, with the exception of the trachoma-coccus. Weaker solutions of these substances, or a four-per-cent. solution of boric acid, do not affect the vitality of these microbes in the least after an action of five minutes' duration.

This paper of WEEKS (211) may be considered supplementary to his article on the same subject in these ARCHIVES, vol. xv., No. 4. He offers additional cases and some practical conclusions as regards treatment. He finds that the microbe does not develop below 30° C., and he finds, by actual experimentation, that the temperature of the conjunctival sac can be reduced to 30° C., provided the lids are but little swollen. BURNETT.

212. ABADIE, CH. Nouveau traitement du kératocone. *Arch. d'ophth.*, vol. vii., 3, p. 201.

213. CANT, W. J. On the treatment of conical cornea by the actual cautery. *Brit. Med. Jour.*, 1887, No. 1,384, p. 174.

214. GALEZOWSKI. Les hémorrhagies de la cornée et de leur diagnostic differentiel. *Rec. d'ophth.*, 1887, No. 4, p. 201.

215. Gillet de Grandmont. De la kératite trabéculaire. *Rec. d'ophth.*, 1887, No. 5, p. 323.

216. Merten, H. Contribution to the treatment of purulent keratitis. *Inaug. Diss.*, Berlin, 1887.

217. Neese, E. The behavior of the epithelium in the healing of linear wounds of the cornea, and wounds with the lance-shaped knife. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 1, p. 1.

218. Trousseau, A. Sur l' étiologie de la kératite interstitielle. *Soc. franç. d'ophth.*, 1887.

219. Valude. Ablation d'un staphylôme chez une malade arrivée à la dernière periode de la phthisie. *France méd.*, 1886, p. 1,690.

Instead of excising a narrow crescentric strip from the cornea, as Galezowski does for keratoconus, Abadie (212) burns a deep furrow with the galvano-cautery at the upper edge of the cornea, without penetrating into the anterior chamber. This method is certainly easier than that of Galezowski. The clinical results, which are said to be very good, are reported in the dissertation of one of his scholars. (Du kératocone et de son traitement par la cautérisation ignée périphérique.—Dr. Guiot, 1887.)

v. Mittelstädt.

Galezowski (214) reports two cases of hemorrhage into the cornea. They were observed in a woman aged 40, in an eye with absolute glaucoma, and in a young man aged 19, as the result of an injury. That the blood was in the cornea and not in the anterior chamber was proven by the fact that the iris was visible behind it, that it did not change its position with inclinations of the head, and that there was no horizontal upper boundary line.

Marckwort.

Gillet de Grandmont (215) describes as "trabecular keratitis" an inflammation of the cornea, characterized by more or less marked gray streaks and lines. These lines are sometimes parallel, sometimes radiating or intersecting; they begin in the centre of the cornea with a very fine line, and gradually spread out peripherically to the limbus. According to Gillet de Grandmont, these streaks are the normal canals of the cornea, which only become visible when abnormally filled. This form of keratitis must not be confounded with the one resulting from micro-organisms, and also having a stellate appearance.

Marckwort.

Of 58 patients at the ophthalmic clinic of the University of

Berlin suffering with purulent keratitis, 23 were treated with medicinal remedies, and 35 with the galvano-cautery. According to Merten (216) phthisis bulbi occurred in 2 cases among these, adherent leucoma in 12, total posterior synechiæ in 5, in 7 the result remained unknown, and 32 were cured, with maculæ of larger or smaller size. The indication for the galvano-cautery was given by an affection of the lachrymal sac, and in those cases in which the suppuration could not be checked with medicinal remedies.

Neese (217) fond that, an hour after the cornea had been cut through with a linear or lance-shaped knife, the epithelium at the margin of the gaping wound ended with a sharp edge. After four hours it had covered the whole thickness of the edges of the wound ; after 6 to 10 hours it passes in several layers down along the edges of the wound, and after 12 hours has reached the middle of the entire extent of the latter. After 15 hours it has passed this point, and a bridge is formed with two epithelial proliferations lying side by side. In the next 24 hours the epithelium is raised, and after 48 hours the whole upper half of the wound is filled with it, and the level of the cornea is almost reached. As the middle layers of the cornea do not gape after the section, while the upper and lower ones do, the epithelium cannot go any deeper. An upper and a lower funnel are therefore formed while the middle lamellæ unite. The karyokinesis is most active during the fourth hour in a large extent around the wound. In the tenth hour it is less marked, and the karyokinetic figures have lost their zonular arrangement. In the twelfth hour, karyokinesis in the epithelium of the wound itself is first observed. After 24 hours, the karyokinetic process has come to an end. The middle layers of the cornea, as already stated, remain in contact and are united by the liquid oozing from the parenchyma. The upper funnel is closed by the epithelial proliferation mentioned above, the lower by a coagulated plug. The wound remains in this condition for about two days. Then numerous round cells are formed, especially at the edges of the wound. They must be regarded as coming from the fixed corneal cells. On the fifth day the swelling of the corneal parenchyma diminishes. The round cells assume an oval shape. Fibrous metamorphosis and retraction of the newly formed connective tissue exert a pressure upon the epithelial plug, which gradually degenerates. The upper funnel is filled with new connective tissue at the end of two weeks. The epithelium over the wound does not differ any longer from the neighboring healthy epithelium.

TROUSSEAU (218) found that among forty cases of interstitial keratitis thirty-seven were affected with hereditary syphilis ; he also usually observed the characteristic teeth. Great mortality of the children, or frequent abortions, were common in these families. Abadie agrees with Trousseau in general, and recommends subcutaneous injections of mercury. But even when this treatment was adopted Wecker saw the other eye become affected. Abadie and Wecker made the observation that in late years the cases of interstitial keratitis were more severe than formerly. According to Haltenhof, more than half of all the cases of bilateral interstitial keratitis can be traced to hereditary syphilis ; even acquired lues gives rise to this ocular affection more frequently than is generally assumed. Poncet, Javal, and Landolt saw interstitial keratitis result from malarial cachexia. MARCKWORT.

Sections XI.–XVIII. Reviewed by DR. NIEDEN.

XI.—IRIS.

220. PANAS. Tuberculose de l'iris. *Journ. de méd. et chir. prat.*, p. 210, May, 1887.

221. QUERENGHI. Irite plastica destra guarita coll' injezione ipodermico di calomelano alla tempia. *Gaz. d'ospit.*, vol. viii., p. 38, May, 1887.

222. SCHIRMER. Iritis in diabetes. *Zeh. klin. Monatsbl.*, vol. xxv., p. 172.

223. SCHWEIGGER. Anterior synechia without perforation of the cornea. *Arch. f. Augenhk.*, vol. xvii., p. 403.

QUERENGHI (221) reports a case of not specific iritis with adhesions, which had been treated for three weeks with atropine and derivatives without any effect upon the condition. A subcutaneous injection of calomel at the temple (0.04 in 10 parts of glycerine) had the most surprising effect. Within twenty-four hours the atropine produced its effect, and in four days more the whole disease was over. The author recommends these injections, not only in syphilitic iritis, but also in all cases of congestion of the iris and ciliary body. DANTONE.

SCHIRMER (222) briefly reports a case of iritis in diabetes, in which only the pertinacity of the disease drew the attention to the urine, there being no other symptoms, and also mentions a case of diabetic amblyopia, in which death suddenly supervened while the patient was comatose.

XII.—GLAUCOMA.

224. MOTAIS. Traitement chirurgical du glaucome par la création d'une fistule conjonctivale. *Soc. franç. d'ophth.*, May 4, 1887.

225. SUAREZ DE MENDOZA. Oulétomie et iridectomie secondaires dans lá recidive du glaucome opéré. *Rec. d'ophth*, 1887, No. 6, p. 348.

226. VACHER. La sclérotomie équatoriale dans le glaucome. *Soc. franç. a'ophth.*, May 4, 1887.

MOTAIS (224) performs posterior sclerotomy by seizing the conjunctiva above the cornea, rotating the eye, and making a section 6·8 *mm* in extent, 4-5 *mm* behind the equator, between the superior and external recti muscles, the knife being brought forward as the section is made. A little vitreous is allowed to escape, and the forceps is removed, so that the wound, by the laxity of the conjunctiva, becomes a subconjunctival one. Fifteen patients were operated in this manner, in thirteen of whom a scleral fistula formed, so that the intraocular liquid could freely enter the pocket which formed under the conjunctiva. In these thirteen cases the patients were permanently cured, the other two not, as the opening in the sclera closed. Galezowski advises to make a small section in posterior sclerotomy, so that *no* fistula may form, which he claims leads to atrophy, while Dianoux tries to obtain just the opposite, namely, a long-continued gaping of the wound by massage (in iridectomy also). Wecker and Panas decidedly and openly assert that many cases of glaucoma are not cured by any operation, or only by enucleation.

MARCKWORT.

SUAREZ DE MENDOZA (225) advises the detachment of incarcerations of the iris, the result of an iridectomy for glaucoma, and followed by a relapse of that disease. To accomplish this he plunges the knife through the cornea, edge downward, at the point of contact between the upper corneal quadrant and the three lower quadrants, prolongs the section downward to the neighborhood of the transverse diameter of the cornea, and utilizes (after instilling eserine) the two wounds thus formed for drawing out and abcising the iris, the knife, of course, having been withdrawn. MARCKWORT.

VACHER (226) performed equatorial sclerotomy in the following manner in six obstinate cases of glaucoma : While the eye looks downward and inward, Vacher plunges a lance-shaped knife into the sclera and deep into the globe between the superior and external recti muscles, about 8 to 10 *mm* from the corneal margin. A considerable quantity of vitreous escapes from the section, which is made about 8 *mm* long. In five of the six cases the result is said to have been very good. MARCKWORT.

XIII.—LENS.

227. BOÉ. Recherches expérimentales pour servir à l'étude de la cataracte traumatique. II. Part. *Arch. d'ophth.*, vol. vii., No. 3, p. 193. With illustrations.

228. BURNETT, S. M. Remarks on cataract extraction. *Jour. Amer. Med. Assoc.*, April 9, 1887.

229. COLBURN, J. E. The galvanic current in the treatment of certain forms of cataract. *Ibid.*

230. LANGENHAGEN. Contributions à l'étude du traitement des cataractes non mûres. *Thèse de Nancy*, 1887.

231. MÖLLER. On the occurrence and operative treatment of cataract in dogs, with report of cases. *Zeitschr. f. vergl. Augenhk.*, 1887, p. 138.

232. SEREBRENNIKOWA, EUG. Short report on one hundred extractions performed at the hospital at Perm. *Wratsch*, Nos. 24 and 25.

233. SIMI. Sutura del lembo dopo la estrazione della cataratta. *Boll. d'ocul.*, vol. ix., 10–11, p. 79.

234. DE WECKER. De l'extraction de la capsule antérieure dans l'opération de la cataracte. *Soc. franç. d'ophth.*, May 3, 1887.

BOÉ (227) saw, while pursuing his studies on traumatic cataract, the appearance of a layer of pseudo-epithelium on the posterior capsule. This pseudo-epithelium begins posteriorly from the point where the epithelium of the anterior capsule ceases, and its nuclei are much thicker than those of the latter. On the left side of the lens it covered the inner surface of the posterior capsule, and where this was absent it lay directly upon the lens-substance. On the right side of the lens it covered the outer surface of the capsule. With the aid of illustrations prepared from microscopic specimens the author demonstrates the development of the pseudo-epithelium from the layer of cells covering the ciliary body. V. MITTELSTÄDT.

Burnett (228) reports twenty-five extractions of senile cataract. Of these ten were without an iridectomy. Two were extracted in the capsule. There were two losses, one from hemorrhage into the eye, from vomiting, and one from suppuration. In the latter the operation was done under strict antiseptic precautions. All the cases were treated in the open wards of a general hospital. He thinks extraction without an iridectomy will become the rule in the not distant future. Burnett.

Colburn (229) gives the results of his treatment of incipient cataract by means of the continuous current of electricity. Three cases were not benefited. In six the benefit was decided and continued while the patients were under observation—from four to seven years. In three cases there was complete removal of short lines and nebulæ, and in two there was complete absorption of opacities. Burnett.

Langenhagen (230) recommends artificial ripening of cataract according to Böhmer. Two or three small openings are made in the capsule with a division-needle, followed by massage with the finger on the upper lid, after the aqueous has entirely escaped. Report of thirteen cases. Marckwort.

Serebrennikowa (232) saw in one case panophthalmitis after extraction, in two suppuration with V = 0. In two cases the extraction was successful, although blennorrhœa of the lachrymal sac had been overlooked. The success in these two cases is ascribed by the author to the dusting of iodoform upon the wound, which he never omits. Hirschmann.

Simi (233) sutured the flap according to Barraquer in the case of a cataract patient, who was also suffering with entropium resulting from trachoma, and whose cornea was vascular. The wound healed rapidly, although the operation caused an immediate increase of the pannus. Dantone.

Wecker (234) again extracts the anterior capsule with the forceps ; but as he has abandoned the iridectomy he cannot use the forceps of Förster and Colsmann, and so has returned to one he devised in 1871, the teeth of which lie nearer the end. With this instrument he claims he can extract the anterior capsule in ninety per cent. of all cases. Panas and Galezowski are opposed to the use of Wecker's forceps. Marckwort.

XIV.—VITREOUS.

235. Magnus, H. A case of visibility of Cloquet's canal. With illustration. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 204.

XV.—RETINA AND FUNCTIONAL DISTURBANCES.

236. ARMAIGNAC. Amaurose hystérique monolatérale. Guérison complète et subite sans traitement. *Soc. franç. d'ophth.*, May 6, 1887.

237. DARIER. Sur la pilocarpine. *Soc. franç. d'ophth.*, May 5, 1887.

238. GOLDZIEHER. Report of cases of Hutchinson's changes at the fundus. *Wiener med. Blätter*, No. 14, 1887.

239. HIRSCHBERG, J. Leucæmic retinitis. *Centralbl. f. Augenhk.*, 1887, p. 97.

240. PONCET. Statistiques des décollements de la rétine. *Soc. franç. d'ophth.*, May 3, 1887.

241. WEBSTER, D. A case of complete detachment of the retina, with œdema and formation of serous cysts. *N. Y. Med. Jour.*, May 14, 1887.

ARMAIGNAC (236) saw an hysterical amaurosis which had lasted four years disappear suddenly without treatment, in a girl aged ten, who had already menstruated, and is inclined to ascribe the cure to the excitement in which the girl was thrown when she heard that her case was a serious one requiring the consultation of several physicians. MARCKWORT.

DARIER (237) discusses the value of pilocarpine in making the differential diagnosis betweed toxic amblyopia and gray atroph of the optic nerve. While the subcutaneous injections have no effect upon vision in gray atrophy, there is an immediate improvement in toxic amblyopia. Though this is only temporary, repeated injections can make it permanent. On this occasion Coppez reports that he had injected 0.3 of pilocarpine without producing a toxic effect, in a patient who had received a subcutaneous dose of 0.02 of atropine by mistake. Suarez observed severe clonic cramps after an injection of 0.035 of pilocarpine. Poncet advises to inject pilocarpine very carefully in albuminuria, as it easily causes retinal hemorrhages in this disease. MARCKWORT.

GOLDZIEHER (238) reports four cases of the central retinal affections described by Hutchinson, in which the yellowish or whitish dots not surrounded with pigment are found symmetrically arranged around the macula, the centre of the latter always remaining free. There is a central scotoma of varying extent. Recovery may take place, or the condition may remain unchanged for years. It is frequently complicated with extensive hemorrhages into the vitreous, and Goldzieher found in all cases general atheromatous changes. Advanced age, especially in women, seems to predispose.

Hirschberg (239) reports a case of leucæmic retinitis in a patient aged thirty-one, who was first treated on account of a central scotoma of one eye resulting from hemorrhage, while the ophthalmoscope already revealed numerous small hemorrhages, some of them with a bright white centre. Later a hemorrhage at the macula of the other eye also took place. The round white spots, surrounded with a broad zone of blood, accompanied with numerous small hemorrhages, gradually increased in number. At the same time the spleen began to swell, its length being 40 *cm*, its breadth 18 *cm*. The white blood corpuscles equalled the red in number. The patient had acquired syphilis thirteen years before.

Poncet (240) presents statistics of detachment of the retina, according to which this disease occurs most frequently among the rural population, a conclusion which is denied by Gorecki. Poncet is opposed to any operation whatsoever in this affection, while Galezowski and Bettremieux recommend iridectomy. Dor obtained good results with the artificial leech. Coppez performed iridectomy in eighteen cases and Wolfe's operation in seventeen, but is of the opinion that as yet no successful method of treating detachment of the retina has been devised. Marckwort.

Webster's (241) patient was a man sixty-six years old, highly myopic ($\frac{1}{2}$), and a sufferer from chronic bronchitis. The retina of the right eye became detached during a spell of coughing, and vision was lost. The eye was enucleated five years afterwards because of chronic inflammation. It was examined by Dr. van Gieson, who found complete detachment of the retina, capsular cataract, and partial degeneration of the lens. There were numerous small cysts between the limitans externa and external molecular layer, and two larger ones 5 *mm* in diameter.

Burnett.

XVI.—OPTIC NERVE.

242. Deutschmann, R. On optic neuritis, especially so-called choked disc and its connection with cerebral affections. Jena, 1887. G. Fischer. 68 pp.

Deutschmann (242) endeavors to show the development of choked disc with the aid of experiments, starting from the observation that in this affection the autopsy hardly ever reveals a marked dropsy of the sheaths of the optic nerve, while the inflammatory symptoms are very marked. He was never able in the course of his experiments to produce the symptoms of well-defined choked disc by the simple injection of indifferent, *i. e.*, sterilized solutions of agar-agar colored with India ink, no matter whether he injected into the sheaths of the optic nerves or directly into the subdural space or the brain itself. After a short time the ophthalmoscopic symptoms of choked disc disappeared, such as tortuosity and dilatation of the veins. When, however, he injected septic substances, for instace, weak emulsions of staphylococcus or tubercle bacilli, he always obtained the distinct picture of choked disc, though increased pressure in the cranial cavity or compression of the optic nerve was out of the question in this instance ; the affection of papilla must have been the result of an inflammatory process. Deutschmann therefore believes that in man also choked disc, as we see it, for instance, so frequently in intracranial tumors, does not depend upon the intracranial pressure, but upon the presence of a specific virus, for which, perhaps, there is a predisposition in these cerebral affections, and which spreads to the optic nerves. He then sifts the literature of the subject from this point of view, with the intention of ascertaining the correctness or falseness of this theory.

XVII.—INJURIES (FOREIGN BODIES) AND PARASITES.

243. BOURNONVILLE, E. Case of extraction of a piece of gun-cap. *Centralbl. f. Augenhk.*, 1887, p. 136.

244. DEBIERRE. Corps étranger de l'œil expulsé spontanément. *Soc. franç. d'ophth.*, May 6, 1887.

245. FRANKE, E. Supplementary remarks to the report of cases of rents in the sphincter of the iris. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 1, p. 245.

246. PFALZ, G. Cases of injury. *Zeh. klin. Monatsbl.*, vol. xxv., p. 233.

247. SCIMENI. Sull' azione dei corpi estranei nell' occhio. *Riv. internaz.*, vol. iv., 1, p. 10.

248. TORNATOLI. Due casi di cisticerco sottocongiuntivale. *Giorn. internaz. di scienz. med.*, vol. ix., 5, p. 398.

BOURNONVILLE (243) describes the successful extraction of a piece of gun-cap from the vitreous with forceps through a meridional incision through the sclera, the media being already quite cloudy. A year later the result was still comparatively good.

Debierre (244) reports the case of a child eight years old, into whose eye a foreign body (a piece of cartridge) had entered through the sclera about 1 *mm* from the upper outer corneal margin. Two days after the injury Meyer introduced a probe, but could not find the foreign body. Fifteen months afterwards a black spot was observed at the point of injury, which felt hard when touched with the probe. It proved to be the foreign body, and was easily removed. Marckwort.

Pfalz (246) saw an air-bubble enter the vitreous after a piece of steel which had penetrated the upper lid, the globe, and the lens in its equatorial portion. It simulated at first the presence of the foreign body behind the lens, while the piece of steel was found near the papilla in the posterior part of the vitreous. It was extracted with a magnet and $V = \frac{20}{100}$ obtained. The foreign body was 3 *mm* long and 2 *mm* wide.

According to Scimeni's (247) experiments, foreign bodies, when aseptically introduced into the eye, cause no irritation ; some, however, like copper, produce an inflammation by their chemical action. A purulent inflammation is always due to micro-organisms which enter with the foreign body. Dantone.

Franke (245) adds abstracts of three older observations of Vermyne and Gallenga to his former paper (*cfr.* Rev., No. 696, 1886, Ger. Ed.) on rents in the sphincter of the iris, with two more of his own, so that he begins to doubt the "great rarity" of this affection, an observation with which every one who has seen many cases of injury to the eye will agree.

Pfalz (246) also reports a case of rents in the sphincter of the iris after contusion of the globe, in which the rents were found at the edge of the iris opposite the point where the blow was received, while at the same time the tissue at the posterior part of the globe was probably torn. The relaxation of the coats of the eye thereby produced led to the development of a myopia of 2 D in the course of the next week.

Tornatoli (248) reports on two cysticerci, the size of a pea, which were removed by Tartuferi from the ocular conjunctiva, and describes their histological structure. Dantone.

XVIII.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

249. Alexander. Circumscribed softening in the right pedunculus cerebri. *Deutsche med. Wochenschr.*, 1887.

250. ARMAIGNAC. Amaurose hystérique monolatérale. *Cfr.* Rev., No. 236.

251. BOUCHERON. Cyclitis minima rhumatismale ou goutteuse. *Soc. franç. d'ophth.*, May 2, 1887.

252. BRUNS, H. D. Amblyopia following sudden discontinuance of accustomed alcoholic stimulants. *N. Y. Med. Jour.*, 1887.

253. CHEATHAM, W. Nasal reflexes as a cause of diseases of the eye. *Amer. Practitioner and News*, 1887.

254. FARAVELLI. Fenomeni oculari riflessi da tænia solium. *Ann. di ottalm.*, vol. xvi., 1, p. 63.

255. GAILLARD. Contribution à l' étude de la phlébite des veines ophthalmiques. *Thèse de Paris*, 1887. Phlebitis of the ophthalmic veins due to a furuncle of the nose ; death.

256. KUBLI. Four cases of erythropsia. *Wjestnik ophth.*, vol. iv., No. 3.

257. MAGNUS, H. Z. Cases of irritation of the sympathetic nerve. *Zeh. klin. Monatsbl.*, vol. xxv., p. 207.

258. PECHDO. Enucléation d'un globe oculaire amenant la guérison de l'épilepsie. *Rec. d'ophth.*, 1886, No. 6, p. 346.

259. RAMPOLDI. Un caso di ambliopia saturnina. *Ann. di ottalm.*, vol. xvi., 1, p. 54.

260. ROLLAND. Les troubles de la vision dans le diabète sucré sont-ils des phenomènes de consomption ?

261. SCHIRMER. Iritis in diabetes. *Zeh. klin. Monatsbl.*, vol. xxv., p. 172. (*Cfr.* Rev., No. 222.)

262. STEVENS, G. T. Irritations arising from the visual apparatus, considered as elements in the genesis of neuroses. *N. Y. Med. Journ.*, April 16, 1887.

263. ZIEM. Visual disturbances after the application of the galvano-cautery in the nose. *Centralbl. f. Augenhk.*, vol. xi., p. 131.

ALEXANDER (249) reports the clinical history and post-mortem condition of a patient aged forty-six, who twenty years previously had acquired syphilis, and who was suffering with a tumor in the right pedunculus cerebri. This tumor caused a paralysis of the outer branches of the oculomotor nerve of the same and paresis and paræsthesia of the extremities of the other side, followed subsequently by total paralysis of the inner branches also of the oculomotor nerve, without however affecting sight, and without any ophthalmoscopic changes. Death was caused by bronchopneumonia.

In BRUNS' (252) case the man had been drinking heavily and suddenly stopped. V. was at once reduced to fingers at four feet. The ophthalmoscope showed the papilla dim in outline in the right, normal in the left. In six days, under hypodermic injections of strychnine, V. $\frac{20}{20}$. BURNETT.

PECHDO (258) saw a patient recover from epilepsy after an enucleation. At the age of twelve he was struck on the right orbit with a stone; sight diminished, and eleven years afterwards suddenly failed entirely. Soon after he complained of pain in the right side of the head, which lasted for twenty-four hours and returned at irregular intervals. At the age of twenty-six the patient was attacked with epileptic fits, which were preceded by phosphenes. These attacks took place about once every two months; after they had lasted for four years, the left eye became affected with serous iritis, which frequently returned until the right was enucleated. This operation was done in April, 1883, and since that time no epileptic attacks have been observed to date (February, 1887). The retina was found detached in the enucleated eye, and the lens appeared ossified. MARCKWORT.

CHEATHAM (253) records three cases where asthenopia has persisted after correction of all refractive and muscular troubles, in which relief was obtained by treating the diseased nasal conditions, polypi, septum deflections, etc. BURNETT.

FARAVELLI'S (254) patient had observed phosphenes two or three times every night in his right eye for a week, which were followed after a few minutes by a dimness of sight also lasting but a short time. After a pause of three months the attacks returned with much greater intensity. After seeing the little flames, vision in the right eye was lost almost entirely, and that of the left also became dim. The phenomenon now occurred daily, lasted five minutes, and then normal vision was restored. The ophthalmoscope revealed anæmia of the central retinal artery, engorgement of the veins, and in the right eye pulsation of the latter. V in both $\frac{20}{20}$. In searching for the cause of these remarkable phenomena, Faravelli found the eggs and parts of tænia solium in the dejections. The patient remained free from the attacks for two months, after a large number of pieces had come away, and recovered completely when after a relapse the head of the tapeworm was removed. DANTONE.

Kubli (256) reports four cases of erythropsia : 1. that of a lady aged 78. Extraction was performed on the right eye in May, 1884, with a broad iridectomy downward, V = 0.3. In the left, incipient cataract, with fairly good sight. The patient uses the eye which has not been operated upon. In February, 1885, after reading for a long time, a first attack of erythropsia in the aphakial eye, lasting several days. A second attack in March, 1886, after the patient had been exposed to strong sunlight. Color-perception good, but all colors seem paler to the operated eye. 2. A healthy woman, thirty-three years old, in ninth month of pregnancy. Sees every thing red, after a strict fast lasting some time. Emmetropia ; V = $\frac{20}{20}$. Color-perception normal, but all colors seem paler. 3. Woman, thirty-three years old, in ninth month of pregnancy, suffering for two months after a long and strict fast with hemeralopia ; intense erythropsia for three days. Emm.; V = 0.9. Color-perception normal ; perception of light diminished. 4. Woman, thirty-four years old, suffering for three weeks with hemeralopia after a strict fast ; complains of erythropsia under artificial illumination. H = 1D. V = $\frac{20}{20}$. Color-perception normal, perception of light much reduced. Three days after the end of the fast the patient had recovered. The connection in cases 3 and 4 of the erythropsia with the hemeralopia, a purely retinal affection, seems to indicate, in the author's opinion, a retinal origin of the erythropsia in these cases at least.

Hirschmann.

Magnus (257) observed sympathetic irritation of the right side of the face in a woman aged fifty-one, suffering with supra-orbital neuralgia of the left side ; it was noticed after the slightest irritation, and manifested itself by excessive perspiration, redness of the face, and dilatation of the pupil, while the palpebral fissure was not wider, nor was there exophthalmus. The right thyroid gland was somewhat enlarged. Function of the heart normal. The eleven-year-old son of the patient also showed symptoms of temporary irritation of the sympathetic nerve, the pupil enlarging and contracting spasmodically.

Rampoldi (259) found that in a lady whose sight had been diminishing for two years, and who frequently suffered with megrim, sleeplessness, a sense of fear, and slight intestinal affections, the cause of all the troubles could be traced to a hair-wash, containing as its principal ingredient about 3 % of acetate of lead. V in the right eye $\frac{1}{4}$, in the left $\frac{1}{2}$; pupil reacts slowly ; F complete. The ophthalmoscope revealed peculiar finely granular opacities of the vitreous and contracted retinal arteries. The patient completely recovered in a month after leaving off the hair-wash and taking iodide of potassium. Dantone.

Rolland (260) discusses in an interesting paper the diabetic affections of the eye, and reports a case of diabetic complete paralysis of the oculomotor nerve of the right eye with slight opacity of the lens. The patient recovered in a month and a half after being put under antidiabetic treatment and receiving injections of strychnine at the temple. Marckwort.

The theme of Stevens' (262) paper, as stated by himself, is that "difficulties attending the functions of accommodating and of adjusting the eyes in the act of vision, or irritations arising from the nerves involved in these processes, are among the most prolific sources of nervous disturbances and more frequently than any other conditions constitute a neuropathic tendency." In support of this proposition he relates cases of epilepsy, chorea, neuralgia and insanity, which had been cured or relieved by tenotomy of one of the ocular muscles when insufficiency had been demonstrated. A full exposition of his methods is to be found in a series of papers in course of publication in these Archives, vol. xvi., p. 149, June, 1887. Burnett.

Ziem (263), who is also a specialist for diseases of the nose and ear, has been induced to give up the galvano-caustic treatment of the nasal mucous membrane several years ago, on account of the visual disturbances caused thereby. He saw not only severe congestion of the ciliary body, but also of the retina and optic nerve (venous pulse), follow such treatment, causing accommodative disturbances and periodic obscurations of the sight. He obtained many good results by drawing blood from the nose with the galváno-cautery, by applying it to the nasal mucous membrane and then suddenly tearing it away.

MISCELLANEOUS NEWS.

Mr. H. R. Swanzy, of Dublin, has been invited to deliver the "Bowman" lecture before the Ophthalmological Society of the United Kingdom, on November 11, 1888.

Provisional program of the Seventh Periodical **International Ophthalmological Congress,** to be held at Heidelberg, from the 9th to the 12th of August, 1888 :

On the opening day, August 8th, and on August 9th until 9 o'clock A.M., inscription of members and visitors.

Thursday, 9th of August.—1. Meeting at 9 A.M. Reception of members and visitors by a member of the committee. Election of President, Secretary, and other officers. Report on "Glaucoma." Reporter : Mr. Priestley Smith (Birmingham). Second reporter : Mr. Snellen (Utrecht). Discussion. 2. Meeting at 3 P. M. Lectures and Papers, of which previous notice has been given.

Friday, 10th of August.—3. Meeting at 9 A.M. Report on "Cataract." Reporter : Mr. Gayet (Lyon). Second reporter : Mr. Schweigger (Berlin). Discussion. Lectures and Papers, of which notice has been given. 4. Meeting at 3 P.M. Lectures and Papers, after previous notice.

Saturday, 11th of August.—5. Meeting at 9 A.M. Report on "Bacteriology." Reporter : Mr. Leber (Göttingen). Second reporter : Mr. Sattler (Prag). Lectures and Papers, after previous notice. 6. Meeting at 3 P.M. Lectures and Papers, after previous notice. In the evening, at 6 o'clock, Congressional supper in the Old Castle.

Sunday, the 12th of August.—Particular morning arrangements reserved. During the afternoon, Fête Champêtre in Ziegelhausen, in the valley of the Neckar, arranged for the Congress by the city of Heidelberg, with boat excursion on the Neckar. After sunset, illumination of the Old Castle.

Notice : The general meetings of the Congress are expected to take place in the Aula of the University. For demonstrations and experiments special rooms will be reserved.

A detailed program will be issued.

Provisional Committee : Otto Becker, Heidelberg ; W. Hess, Mayence ; J. Stilling, Strasburgh.

Dr. CORNELIUS REA AGNEW

died April 18, 1888, after a short illness (of perityphlitis). He was born in New York City August 9, 1830. On his father's side he was of Scotch-Irish Huguenot ancestry. He received his early education in a private school, entered Columbia College in 1845, and was graduated in 1849. He studied medicine in the College of Physicians and Surgeons, of New York, where he was graduated in 1852. After visiting different renowned medical schools in Europe, he settled in New York as a general practitioner in 1855, and became one of the Surgeons of the New York Eye and Ear Infirmary. He held this position until 1864, when his duties on the U. S. Sanitary Commission, of which he was one of the promoters, compelled him to resign. He did excellent service during the war. He was a public-spirited citizen, an enthusiastic and generous supporter of many charitable and scientific enterprizes, a forcible speaker, a fluent lecturer, an eminently practical and instructive clinical teacher, a refined and hospitable gentleman, a warm-hearted friend, an uncompromising opponent in questions of principle, an active and orthodox Presbyterian, without being intolerant.

His scientific importance must be judged more by his actions and his example than by his literary work. His writings have not been numerous, but they are all instructive. In 1866 he established, on the solicitation of the Faculty, an ophthalmic clinic in the College of Physicians and Surgeons of New York, and in 1867 he was appointed professor of diseases of the eye and ear in the same college, a position which he honorably held until his death. In 1868 he was one of the founders, and for a short time an attending surgeon, of the Brooklyn Eye and Ear Hospital. In 1869 he was the chief originator of the Manhattan Eye and Ear Hospital, which, by his energy, his untiring labor, and unexcelled services, has developed into one of the largest and best-appointed institutions of its kind in America. All his professional work, both private and public, was distinguished by a spirit of caution, neatness, and deliberation. He was one of the most adroit surgeons. The writer of these lines, who often had the privilege of witnessing him at his work, never saw him do a clumsy operation.

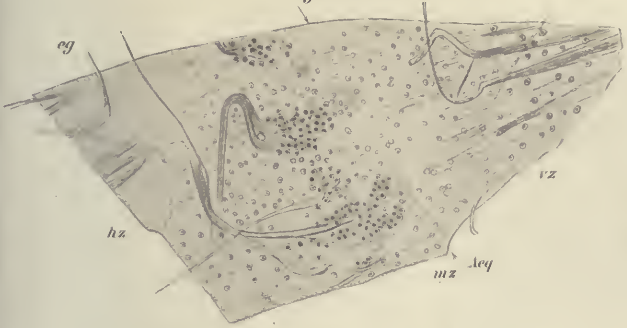
Dr. Agnew led a life of exemplary regularity, conscious that at any moment he might be called upon to assume responsible duties, for which he always not only was prepared but at his best.

He has educated numerous pupils, who, by his advice and recommendations, readily found desirable positions all over the United States. His clinics at the College of Physicians and Surgeons have been very popular, and formed one of the attractions of this celebrated, old, but steadily progressive institution.

His monument, however, will be the Manhattan Eye and Ear Hospital, where his spirit will live in the works of his associates and followers, and his memory in the hearts of thousands of patients. Only a few mortals leave such footprints of their earthly career as Dr. C. R. Agnew.

H. KNAPP.

Fig. 1.



FAIRMOUNT COLLEGE

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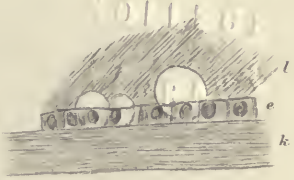

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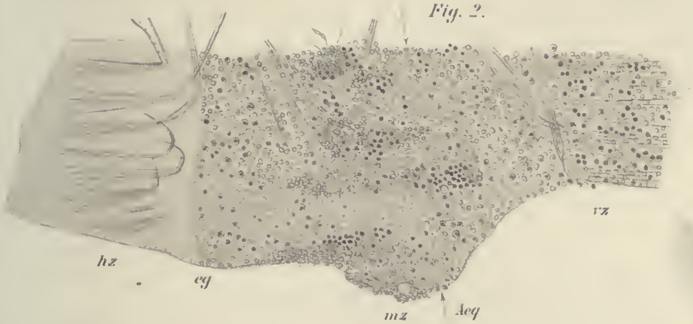

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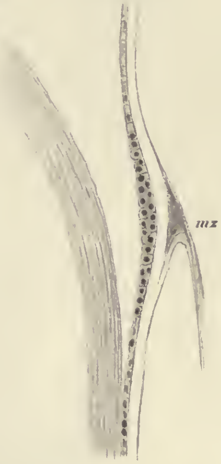

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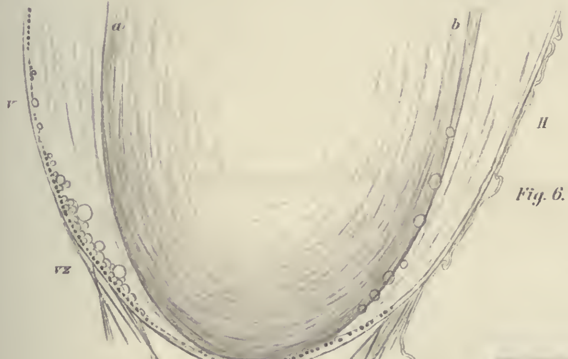

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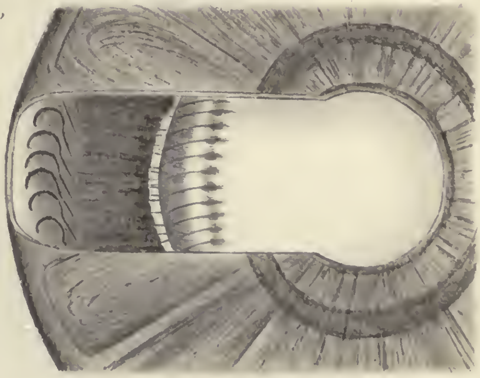

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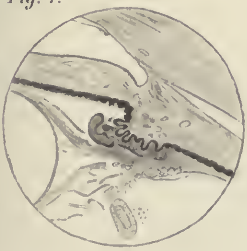

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Tab. II.

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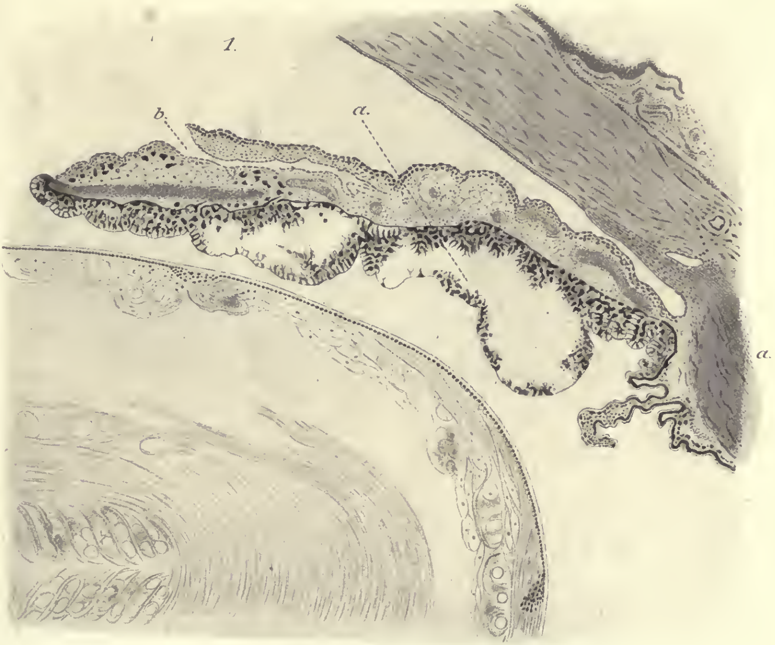

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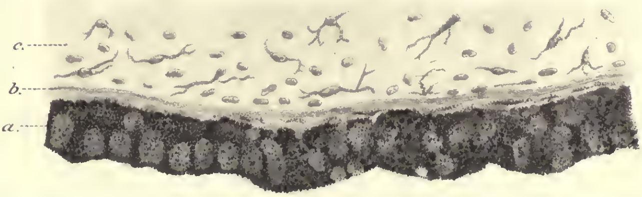

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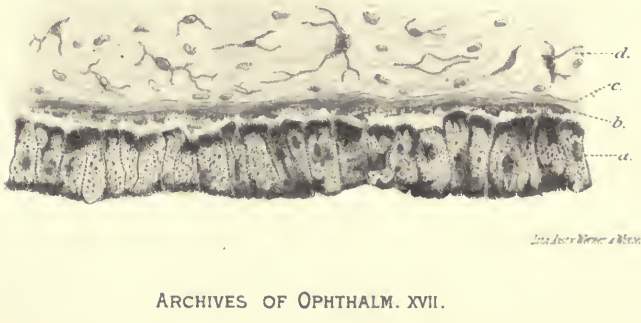

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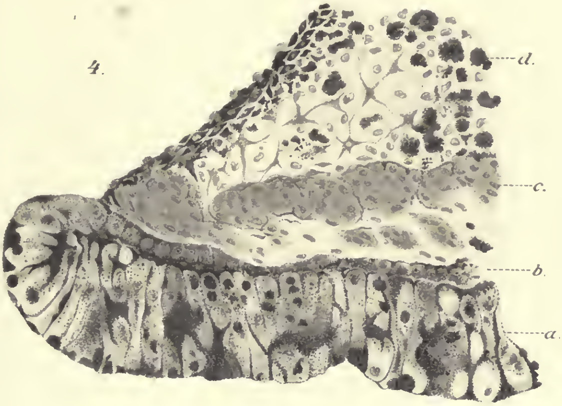

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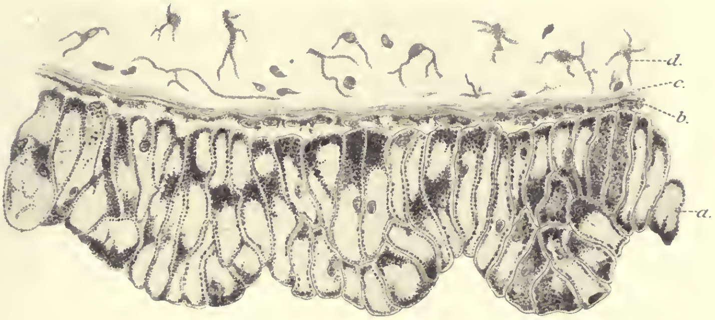

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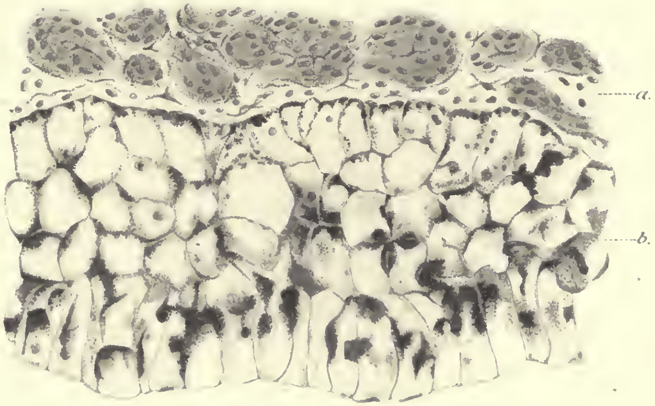

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ARCHIVES OF OPHTHALMOLOGY.

A CASE OF INJURY TO THE EYE FROM LIGHTNING-STROKE.

By Dr. F. BULLER, Montreal.

PROFESSOR OF OPHTHALMOLOGY, MCGILL UNIVERSITY; OPHTHALMIC SURGEON TO THE MONTREAL GENERAL HOSPITAL.

INJURIES by lightning to the organs of vision are so uncommon, and so few unequivocal cases of this kind are to be found in ophthalmic literature, that I believe the one which has recently come under my notice may be worth placing on record.

At first sight it would seem to illustrate the popular prejudice in regard to the supposed danger of sitting near an open window during a thunder-storm, but a little consideration of the surroundings will show that the fact of the person injured being near the window had in reality nothing to do with the accident, inasmuch as with no window at all in that part of the house, *cæteris paribus* the result would in all likelihood have been the same. I am indebted to Mr. James B. Paige, of Amherst, Mass., for the history of the case at the time of and after the accident. Mr. Paige was then a student in the Montreal Veterinary College, and has since taken his degree as V. S. in the same institution. I can vouch for his statements being entirely reliable. I am also indebted to Dr. T. W. Mills, of McGill University, for his kindness in bringing the case under my notice.

The injury caused immediate and prolonged loss of consciousness, with a condition of collapse so intense that for several minutes life seemed to be extinct, and about three-quarters of an hour elapsed before there were any signs of returning sensibility. Mr. Paige, who was himself present at the time of the accident, gives the following description of the occurrence:

"The lightning struck the chimney of the house, and in its downward course divided into three parts. That part of the electric discharge which caused the accident passed to the casing of a window near which the person injured was sitting. Attached by a screw to the upper casing of the window was a large iron hook on which a bird-cage was suspended by means of a brass chain. The electric current followed this chain to the bird-cage, left it at one corner, entered the body of the subject of the accident, and passed out of the room by a nail in the floor. That the electrical influence in this quarter was intense is proved by the fact that the links of the chain were in some places nearly melted apart, while the solder at the corner of the cage, where the fluid left, was completely melted. Again, the nail by which it passed through the floor was considerably roughened; it appeared as if it had been partly melted at a high temperature. There were three other persons present, outside the window on the piazza, at the time, one of whom was thrown down by the shock and rendered insensible for a few seconds; the other two escaped wholly uninjured.

"The young woman inside the window was thrown from the chair on which she was sitting directly across another chair about two or three feet distant. She was taken out to the piazza immediately, and her condition was found to be as follows. Completely unconscious, muscles relaxed, left eye closed, right open, face purple, pulse at wrist imperceptible, neither heart sound nor respiratory murmur to be heard.

"Later on an examination showed the course of the electric current to have been as follows. It struck the head above the left eye between the brow and hair, which was the part apparently nearest to the bird-cage, singeing some of the eyelashes, and leaving a red mark on the brow, thence passing in front of the ear and down the side of the neck in a forward direction, it reached the median line of the thorax; near the lower part of the abdomen it came in contact with a safety-pin, and here caused a rounded eschar in the integument; dividing at this point, it traversed the outer surface of each lower extremity, its course being marked in each by a distinct red line, especially distinct on the left limb, on the back of which just above the knee joint was a burn about the size of the hand. It had the appearance of an ordinary burn, and was only superficial. No trace of the current could be detected again until the foot was reached, from which it passed off by the joint of the great toe, tearing a hole about two inches in diameter in the stocking and slipper, but not leaving the slightest mark upon the skin. With the exception of the burned spot on the posterior part of the left leg, and one or two small burns on the body and the right leg, hyperæmic lines alone marked the course of the electricity in its passage over the body.

"So soon as the clothing about the neck and chest could be loosened, artificial respiration was commenced. In from three to five minutes the first sign of life appeared in the flexion of the right leg. The dark color disappeared from the face, and the pulse could be felt at the wrist; it was then weak, rapid, and irregular. The treatment was kept up for ten or fifteen minutes, until the body began to feel cold, when the subject was removed to a bed in the house. The moving caused a disturbance of the circulation, as was shown by the pulse, which became very faint and fluttering. In order to encourage the circulation cloths wrung out of hot water were applied to the chest, and as soon as they became cool were replaced by fresh ones. Soon a new train of symptoms set in. There was difficult respiration, mucus and saliva, which was very abundant, gravitated back and could not be swallowed because of complete paralysis of the pharynx. There was a similar loss of power in all the muscles of the upper parts of the body as well as those of the upper extremities. The symptoms were those exhibited by an animal when being asphyxiated: violent muscular contraction, difficult and forced respiration, etc. To remove the saliva and mucus which caused the obstruction, the head and trunk were lowered and large quantities of secretion wiped out of the pharynx with handkerchiefs.

"In from one half to three quarters of an hour from the time of the accident consciousness began to return, and the muscles of the arms to regain strength. Sight returned to the right eye, although the eye could not be moved. Though the patient could hear she could not speak. This was shown by the fact that, when asked to press the hand if she felt better, the request was complied with. About this time the paralysis began to disappear gradually from the tongue. There was absence of any considerable pain, and with continued improvement through the night brief intervals of sleep were enjoyed. The next morning, about twelve hours after the accident, there was sufficient effusion in the upper and lower lids of the left eye to close them. This lasted for several days, and when it became absorbed there was noticed a slight effusion in the anterior chamber (?), which interfered considerably with vision. There were no signs of inflammation in any of the parts of the eye. There was a complete return of the cerebral functions, the mind being clear and active as usual. The patient could as yet only swallow a few drops of iced water at a time, and this only with great difficulty. The trouble seemed to be in the pharynx, as the initial acts of drinking were readily enough performed. The pharyngeal paralysis passed away slowly, and after about two weeks solid food could be swallowed. The strength of the patient during this period was sustained by thin gruels, brandy, and a liquid preparation of beef. To allay the great thirst of the first twelve hours small pieces of ice were frequently taken in the mouth. Twelve or fourteen hours after the accident intense pain set in about the head, neck, arms, and chest. That about the chest continued during the first day, but was somewhat relieved by mustard poultices. The pain in the head was constant and very severe, lasting seven days ; during the first five days it was relieved somewhat by cold applications, which were replaced by hot ones on the sixth, and continued for two days ; after this the pain occurred only occasionally. The pain in the neck and arms was not so constant, but when present was severe. The severe pain, preventing sleep at night, was combated by morphia and atropia.

" For five or six weeks the left eye was drawn inward and upward, double vision resulting. At no time during the illness did the temperature rise above 101° F. The functions of the urinary organs were not interfered with at all ; constipation was marked for a time, there being no movement of the bowels for five days after the accident. The latter was brought about by enemata and small doses of gray powder, after which the bowels acted regularly.

" The patient remained in bed two weeks, then sat up for a short time daily, until, at the end of four weeks, she was able to travel thirteen miles in the cars to her own home. Complete recovery has taken place, with the exception of the left eye, the vision of which is somewhat impaired. It is to be noticed that menstruation was in progress at the time of the accident, but continued as though nothing unusual had happened."

At the request of Dr. Mills the young woman came to me for an examination of the eyes, about the middle of last February. There was nothing abnormal in the external appearance of the eyes, and no evidence of injury to the adjacent parts. The conjunctiva, cornea, anterior chamber, and iris appear just as in the other, sound eye. The pupil is of medium size, but does not respond to light quite so promptly as that of the right eye. Vision of the left eye not improved by any glass. Right eye $V = \frac{6}{6}$ a little sharper with -50 c ax. 90°. The existing visual defect of the left eye prevents any accurate estimate of its power of acc., but the ciliary muscle is certainly not inactive. All the extrinsic muscles of the eyes appear to do their work efficiently.

Two hours after free instillation of homatropine, gr. viii. ad unc., there is R, $H = 1.00$ D; $V = \frac{6}{6}$: L, $H = 1.50$ D; $V = \frac{6}{15}$. Although under ordinary circumstances there is binocular vision, a vertical prism gives a latent convergence $= 18°$; abduction $= 3°$; adduction $= 42°$; and there is a doubtful rt. hyperphoria $= 2°$.

It will thus be seen that there is an insufficiency of the external recti, which may of course be her normal condition; or, in view of the fact that she suffered from no visual disability of either eye prior to the accident, it is more probable that the left external rectus has not yet fully recovered from the effect of the injury.

By focal illumination there is seen to be a considerable opacity at the posterior surface of the lens, very like that of an ordinary posterior polar cataract, with this difference, that the opacity is obviously for the most part situated in the lens substance, and does not, like the so-called posterior polar cataract, present a concave anterior surface; the opacity has a circular outline, but is not sharply defined. The circumference being more opaque than the middle part, gives it a ring-like appearance. Beyond the principal opacity there are several cloudy streaks extending towards the periphery. The vitreous contains a few floating particles, so fine that they are with difficulty distinguished even with a $+ 6.$ D ocular behind the mirror.

The optic nerve is very pale, its margins blurred and slightly indistinct, but this indistinctness may partly be due to the defective transparency of the lens. There is nothing else indicative of an optic neuritis, past or present.

In addition to the pallor of the nerve there is a considerable diminution in the calibre of the retinal blood-vessels, both veins and arteries, with a loss of the fine vessels of the papilla to about the same extent as may be observed in an ordinary case of moderately advanced simple atrophy. Several of the larger vessels, both veins and arteries have whitish borders on the papilla and for some distance in the retina. Other than the foregoing there are no visible changes in the fundus oculi until we come to the extreme external periphery, at and somewhat below the horizontal meridian. Here there is a broad patch of irregular choroidal pigmentation composed of ill-defined masses of dark pigmentation, but not so black as the pigmented deposits commonly seen in choroiditis. The anterior boundaries of the pigmented area extend beyond the opthalmoscopic field, but about the centre of the patch there is an irregular break about the size and shape of two optic papillæ half overlapping each other. This patch, though of a much paler hue than the surrounding dark pigmentation, is itself partly covered with pigment, but is of a dull orange color. If its pallor is due to atrophy of the choroidal stroma at this part the atrophy is not sufficiently advanced to show the tendinous whiteness of the sclerotic.

It would seem to be either a circumscribed rupture of the choroid or an imperfectly absorbed effusion of blood, or, what is more probable, both these conditions may be present.

It will be observed from the foregoing that the injury has resulted in damage to the external muscular apparatus, the crystalline lens, the choroid, and, lastly, the optic nerve, to which latter, no doubt, the visual defect is chiefly due, for in addition to the partial atrophy already noticed there is a very pronounced concentric limitation of the visual field, which certainly cannot be accounted for by any of the other lesions mentioned.

The color-sense, though impaired, is pretty uniformly restricted for all colors.

It is not easy to explain just how this injury to the optic nerve has happened, since we have no knowledge of the ophthalmoscopic changes shortly after the injury. There might have been an effusion into the tissues of the orbit causing pressure on the optic nerve. That something of this kind probably did occur may be inferred from the swelling of the eyelids, which is stated to have lasted several days; or there may have been an effusion of some sort into the sheath of the optic nerve; or an interstitial neuritis, as a result of concussion of the optic nerve. Any one of these conditions might have resulted in the existing partial atrophy. I have not been able to find in ophthalmic literature any case of injury to the eye from lightning in which an ophthalmoscopic examination was made shortly after the injury, with the exception, perhaps, of Brudenell Carter's case [St. George's Hosp. Rep., v., p. 322], incorrectly credited to H. Power by T. Leber as well as by De Wecker and Landolt. In this case such an examination was probably made, but there is no mention of ophthalmoscopic changes; moreover the injury was not caused by direct contact of the electric discharge with the patient's body, and as the man recovered perfect vision a few days after the injury, it is not at all likely that any visible intraocular lesions were induced. Of the few cases that have been reported since the ophthalmoscope came into use, those presenting intraocular lesions were all actually struck by lightning. In one, reported by T. Leber [*Graefe's Arch. für Ophth.*, Band xxviii.], the general disturbance, burning of the surface, shock, and paralysis were greater than in our case. In this instance, too, both eyes were seriously damaged. Nevertheless the ocular lesions in our case are remarkable both in their number and severity.

The injuries known to have been inflicted on the eyes of the few cases hitherto reported, may be summed up as follows: Paralysis of the muscular apparatus, including the muscles of accommodation; cataract; deep-seated changes in the ocular tunics, such as ruptures of the choroid, choroidal and retinal hemorrhages, detachment of the retina, paralysis of the optic nerve in the form of atrophy of the nerve. Four of these conditions were present, or had existed, in our case, and may fairly be attributed to the injury, since, as already stated, there was no visual abnormality prior to the accident.

It will be noticed that all the lesions present were such as are known to result from ordinary forms of traumatism and the inference is obvious that they were caused by mechanical violence, rather than by the chemical or thermal action of the electric current. In support of this view, we also have the fact that the woman was thrown by the force of the electric shock, a distance of several feet from her original position by the open window, a circumstance that cannot be accounted for, except through the agency of external mechanical force.

CASE OF INTRAOCULAR SARCOMA AT CENTRAL REGION.

By A. HILL GRIFFITH, M.D.,

ASSISTANT SURGEON, MANCHESTER ROYAL EYE HOSPITAL.

(*With two wood-engravings.*)

The patient, L. T., a man aged thirty-two years, came under my care at the Royal Eye Hospital on the 7th of November, 1887, complaining of gradual loss of sight in his left eye for eleven weeks; there had been no injury, nor was there any pain. The pupil reacted well, the vision was 16 Jäger, but he held the reading card to one side. On roughly taking the field by the hand test, it was found that the limits were normal, but there was a blank in the centre. The other eye was normal in every respect.

On ophthalmoscopic examination of the affected eye a rounded opaque prominence, closely covered by the retina, was seen growing from the centre of the fundus near the outer side of the optic disc, rising quite steeply at the side near the disc where some retinal vessels ascended, and also above, in both of which directions the limits of the growth were sharply defined. Below and at the outer side it gradually shelved down, and the retina was œdematous and perhaps slightly raised from the choroid at the termination of the growth in these directions. The fundus was elsewhere normal, the appearance of the disc was unchanged, and the refraction of the disc was emmetropic. The most prominent part of the tumor could be seen by a convex lens of 10 D. and was of a lightish yellow color, and the retina covering this part showed some shining particles. No vessels could be seen on the growth save those belonging to the retina. A chart of the field of vision (Fig. 1) taken with McHardy's perimeter, showed a normal periphery, with, just above the centre, a scotoma for form in size about 15° in each measurement.

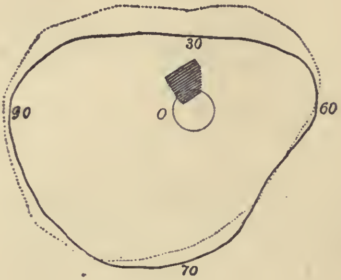

Fig. 1.

The diagnosis was a matter of no difficulty, for it appeared to me that it must be either a sarcoma, or possibly a cysticercus under the retina, and the latter was negatived by the absence of movements when the patient rolled his eye in different directions. Dr. Little, who kindly at my request made careful examination of the eye, fully concurred in my opinion; so with the patient's ready consent I removed the eye in the course of the next few days.

The globe was hardened in Müller's fluid, frozen and bisected into an upper and a lower half, the latter portion being mounted in glycerine jelly in the way described by Priestley Smith in the *Ophthalmic Review*, 1883; the upper portion was kept in spirits and used for microscopical examination. Fig. 2 shows the lower half

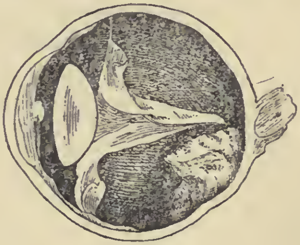

Fig. 2.

of the eye with the main mass of the tumor close to the outer side of the optic disc, but reaching at the temporal side to the equator by an elongated process which here seems to be received into a cleft in the choroid, and becomes incorporated with that membrane. The *total* separation of the retina, shown in the figure, must have been caused by the maceration in the hardening fluid, for it was certainly not present before enucleation of the globe, although as mentioned before the process had just commenced. The vitreous surface of the tumor is smooth and rounded, and uniformly covered by the hexagonal pigment layer. The attached surface is closely applied and adherent to the sclerotic, which is slightly but distinctly bulged backwards at the part corresponding to the most prominent part of the tumor. This tendency of the tumor to perforate at the posterior pole of the eye has, it appears, been noted in several cases of the kind. The cut surface shows the main part to be of a light yellow color and rather open in texture ; the promontory-like process at the temporal side is denser and of a dark chocolate color, and the middle portion has intermediate characters.

From the ophthalmoscopic examination and the size of the scotoma in the field of vision, I was somewhat surprised at the comparatively large size of the growth when the eye was opened. The field was traced in a good daylight and with a travelling object of one half inch in diameter, and the scotoma indicates where the test object *entirely* disappeared. So we must conclude that only a portion of the retina covering the tumor had quite lost its function.

Microscopic sections showed the tumor was a spindle-celled sarcoma with a good deal of fibrous tissue, very few vessels, but a good deal of pigment, and the lamina vitrea of the choroid could be traced over most of the surface.

The *point of interest in the case is the central position of the growth*, for it would appear that comparatively few such cases have been recognized ophthalmoscopically, and I have only been able to find records of the following six cases :

Otto Becker records in these ARCHIVES (1869–70) three cases that were under his own care ; in two the growth had burst through the posterior part of the globe without attaining any great size inside the eye, and in the third the eye was removed when the growth was quite small, and limited to the central region of the fundus. He notes that detachment of the retina is not nearly so liable to take place as in the sarcoma near the equator of the eye, and mentions as a probable reason that the choroid but rarely gives off vessels at the central region.

In the Ophthalmic Hospital Reports, vol. iii., 1860–61, Hulke records a case of Bowman's, in which were observed "a large black tumid rise in the fundus and at the yellow spot, and at the outer and lower sides of this, extensive detachment of the retina." The diagnosis was "effusion between the choroid and sclerotic, as well as under the retina, perhaps also melanosis." Glaucoma supervened, iridectomy was done, followed by enucleation of the eye, on dissection of which there appeared complete separation of the retina, and a large, bulging melanotic sarcoma of the choroid growing from the centre, the eyeball itself being ectatic in places.

In vol. v. of the same reports, 1886, Hutchinson mentions a case in which the "retina, just above the outer side of the disc, was detached, and a peculiarly black appearance existed behind it." He did not feel sufficiently sure of his diagnosis to enucleate, but, glaucoma supervening, the eye was ultimately removed.

In the Curator's Report, vol. vii., Nettleship mentions a specimen of sarcoma growing from the yellow-spot region, which Lawson had reported upon four years before incision as "choroiditis with exudation and incipient retinal detachment; V = 14 Jäger.

I do not believe that central sarcoma is so rare a condition as the small number of clinical cases would lead us to believe, for in the Ophthalmic Hospital Reports I find mention of five specimens. In the Curator's Report, vol. vii., Nettleship notes a specimen of melanotic sarcoma of the orbit spreading from the yellow-spot region, but not forming a tumor inside the globe. In this case the scleral blood-vessels were made out to have been the path by which the process spread from the interior of the eye to the orbit.

The Curator's Report, for vol. x., contains a note by Brailey of a specimen of sarcoma close to the optic nerve, projecting into the vitreous; and in vol. xi., in three eyes removed, there was found a sarcoma growing from the central region. One of these cases is recorded by Brailey, the other two by Jennings Miller; all three had caused sympathetic inflammation. In our own Pathological Museum there are three specimens, and I have no doubt that other museums contain numbers of similar specimens.

In sarcoma of the choroid at the equator, or near the ciliary region, no complaint is made till the tumor has attained a considerable size, and, in the large majority, when seen by the surgeon, only one opinion can be entertained in regard to the nature of the affection. But, of about thirty cases I have seen myself since 1879, when I became house-surgeon to this hospital, I do not recollect one case in which the tumor could be called small. On the other hand, in sarcoma commencing at the macula the patient will be very soon aware of something wrong with his sight; in my own case he was from the first conscious of a central blank in his field, and, for this reason, we will be called upon for a diagnosis at a very early stage of the growth, when observers of great experience and recognized skill may be unable to correctly diagnose the condition, as in Bowman's, Hutchinson's, and Lawson's cases, and in Otto Becker's first two cases.

SYNCHRONOUS MOVEMENTS OF THE UPPER LID AND MAXILLA.

By Dr. O. BULL, Christiania.

IN the Transactions of the Ophthalm. Society at Heidelberg, 1887, Prof. Helfreich has reported two cases of unilateral paresis of levator palp. sup. in which opening of the mouth produced an involuntary raising of the lid. In one of these cases there was also on the same side paresis of rect. sup. and V on the corresponding side only $\frac{1}{3}$ of that of the other eye. The following case is quite analogous to the last of Helfreich, but the result of examination of my case shows that the hypothesis set forth by H. scarcely suffices to explain the concomitant movements of the lid and maxilla.

Emil Eberhardsen, tailor apprentice, nineteen years, examined April 14, 1879. He states that the upper lid on his right side always has been drooping, and that the sight of the corresponding eye has been weak. Unquestioned, he tells that he, as long as he remembers, has been aware that the lid is raised when the mouth is opened. The patient was a rather slender, pale-looking lad. His parents, who are not consanguineous, are healthy. There have been eleven children, six of whom are alive. The upper lid droops so much that the palpebral fissure in its widest breadth does not exceed 3 *mm*; it does not become wider when the eye is turned upwards. When he, however, opens the mouth the lid is raised so much that the greater part of the pupil becomes visible. The movements of the globe are free in all directions except upwards, where the eye remains considerably behind its fellow. When the left eye is covered, and the patient directed to look up, he is able to raise the lid to a degree equal to that produced by keeping the mouth wide open, and under such circumstances this does not produce any further raising of the lid. When the eye is turned up as far as possible, efforts to raise it still higher produce oscillatory movements. V r. $\frac{5}{60}$, l. $\frac{5}{18}$. Ophthalmsc.: nothing abnormal.

From the discussion following the communication of Helfreich it appears that Prof. Fuchs and Dr. Fränkel each had seen a case where opening of the mouth produced opening of the lid on one side, but in their cases no ptosis was present. Besides these authors Dr. Nieden made the general statement that, judging from his experience, such synchronous movements were not so rare as the reports of them were few. In a case reported by Dr. Gunn, *Lancet*, ii., No. 3, ptosis was present, but this case is only so far analogous to those of H. and my own, as actions of non-orbital muscles produced raising of the paretic lid (when the head was turned to the right, and the left external pterygoid acted, the lid was raised). Consequently in four cases out of six reported we find ptosis; of these four the action of the digaster in three only produced synchronous movements of the lid. Neither in the case of Gunn,[2] nor in those of H.,[2] can it be seen from the description, whether the patient could voluntarily raise the paretic lid when the other eye was covered. That no statement is made of this is so much the more strange, as it is a well known fact that patients suffering from paresis of the eye muscles are able to make much more excessive movements in the direction of the affected muscle when the other eye is covered than when left free. That in my case the patient was able to raise the lid when the unaffected eye was covered, together with the fact that the opening of the mouth then did not produce any further increase of the

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[1] *L.c.*, The report of the committee appointed by the English Ophthal. Soc. I know only through the remark by Nieden, who states that the committee has come to the same conclusion as Prof. H. as to the explanation of the lid movement.

[2] *Vide* Eine besondere Form der Lidbewegung von Prof. Dr. F. Helfreich, Sonder-Abdruck aus; Festschrift für A. v. Kölliker, Leipsig, 1887, where the cases are reported more fully.

elevation, does not appear in favor of the hypothesis of Gowers and Helfreich. According to this the levator in such cases should be innervated by fibres originating from the centre of the facial or trigeminus, which should unite with those of oculomotor in a similar manner as fibres from the centres of oculomotor and abducens are anastomosing. It seems to me that it is quite as rational to explain the concomitant action of the muscles in question, as synchronous, such as Drs. Rosenmeyer and Nieden have done. In the cases where ptosis is present the patients have, because of the paralysis of the levator (and rect. sup.), no inducement to check synergetic movements raising the lid on the affected side. That synergy in action of the muscles of the maxilla and the eye is very common, is proved by the well known fact that many people, especially children, raise the upper lids when gaping. Anyhow the cases hitherto reported are too scarce to serve as a support of a hypothesis not proved by an anatomical autopsy.

PARALYSIS OF THE OCULOMOTOR NERVE ON THE RIGHT AND OF THE ADUCENS ON THE LEFT SIDE.

By Dr. O. BULL, Christiania.

H. P. S., thirty years, employed at a place of entertainment in this town, called on me July 12, 1882. Three years previously he had a chancre, but he does not believe that this was followed by constitutional syphilis. He is now suffering from paralysis of the *right* oculomotorius ; pupil dilated. Opthalmoscopically nothing abnormal. He was ordered to take a solution of potassii-iodidum. 17th. The paralysis of oculomot. less marked. 20th. Symptoms of incipient paralysis of the *left* abducens. The eye could not be turned further outwards than that the corneal margin was 2 or 3 *mm* from canthus externus. Endeavors to turn it farther out produced oscillatory movements of the globe. 22d. The paralysis of the left abducens now more pronounced ; the eye could be turned out beyond the median line without oscillations. He still takes potassium iodide. The patient did not reappear before May 5th. The paralysis both of the right oculomot. and of the left abd. had then almost disappeared. There was, however, still some ptosis on the right side. He was told to call again, but did not come.

Most probably the paralysis of the ocular muscles in this case has been of syphilitic origin.[1] To the patient's statement that he did not believe he ever had constitutional syphilis, no great weight can be attached, so much the less as he gave me the impression of being an unreliable and careless man. The speedy recovery following the use of iodide of potassium supports this assumption. As to the seat of the affection, this must remain uncertain. Anatomical and physiological investigations make it probable that the fibres through which impulses to associate movements in lateral directions are sent, take their origin from the centres of both the oculomotor and abducens. Duval has shown this to be the case so far as from the centre of abducens some fibres go to oculomotor on the opposite side, and this decussation has been pathologically illustrated by the case of Féréol, in which a tuberculous deposit in the centre of abd., caused a paralysis of the externus on the same side, and of the internus on the opposite. If a similar course of the fibres originating from the oculomotor should be proved, the above case referred to would be explained in a satisfactory manner by supposing an affection in the region of the centre of the right oculomotor.

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[1] A case of incomplete bilateral paralysis of oculomot. and abd. in a syphilitic individual is referred to by Mooren, Fünf Lustren Ophthalmologisches-Wirksamkeit Wiesbaden, 1882, p. 272.

UNILATERAL TONIC SPASM OF THE CILIARY MUSCLE INDUCED BY PRESSURE ON THE CAROTIS.

By Dr. O. BULL, Christiania.

Marie Hansen, single, thirty-eight years old, from Trogstad, was sent to me by Dr. Nissen, of this town. She had been suffering from metritis for several years, but otherwise she had always been healthy. The treatment for her uterine ailment consisted in massage on perineum and pressure on the neck over the carotides. I saw the patient on the 13th of August, 1880. Four days previously, as the physician somewhat forcibly massaged her neck, she suddenly felt a tension in her right eye. After that time every thing appeared to her larger than before, and with a reddish or yellowish red color. By testing each eye separately, she had noticed that she could not see clearly at a distance with the right eye. For the last three or four days she had been suffering from pain in the eye and from headache on the corresponding side. Right eye congested ; pupils of both eyes equal in size, react to accommodative impulses and to light, directly and consensually. The anterior chamber of the right eye considerably narrowed. T normal in both eyes. The patient was very sensitive to pressure on the inner half of the corneal margin. Ophthalmosc. : r. e. pronounced hyperæmia of the optic disc and retinal vessels ; l. e. nothing abnormal. Fundus seen in the right eye with concave 5. 5 D ; l. with 1 D; V $\frac{1}{1}$ both eyes, on the right at a distance with concave 4.5 D L. R $\frac{1}{\infty}$. Light perception, normal both eyes. Visual field, examined with white and colored objects, normal. In the periphery a white object, however, not seldom is mistaken for a violet. I regret that I have forgotten to note the result of the examination for colors in the centre ; as far as I remember it was normal. For the r. e. the objects still appear somewhat reddish and larger than for the left. Punctum proximum, and at the same time remotum, of the r. e. eight inches ; l. e. eight inches and a half. I tried to measure the temperature of the skin on both sides of the head, but the instrument obtained did not give any exact result. A thermometer introduced in the auditory canal for five minutes, showed 0.5° Fahr., higher in the right than in the left. On the 15th of March I made twice an instillation of a 2. 5 p. c. solut. of atropine. The patient was kept under observation until the pupil was dilated ad maximum, and then again examined. The distance of distinct vision still remained within the range of eight inches. She got another instillation before going away. When she called again the following day she told me that she got a clear sight for distance one hour after the last instillation. Refraction now H about 0.45 $(\frac{1}{60}'')$ V$\frac{1}{1}$. Subconjunctival tissue and optic disc still injected. On the following days the patient had attacks of headache, which one day lasted six hours. When observed March 21st, the injection of optic disc seemed increased. On 30th the pupil had fully regained its mobility; there was still some injection of the subconjunctival tissue, but scarcely any of the optic disc. No headache. When last seen, 3d of May, nothing abnormal was found.

This case is, as far as I know, the most striking paradigm of cramp of the ciliary muscle ever reported. That the first impulse of the cramp had resulted from the pressure made on plexus caroticus cannot be doubted, but it seems rather strange that an irritation of the sympathic nerves could produce tonic cramp of the ciliary muscle. That the right pupil acted, shows that the nerves going to the ciliary muscle can have an origin so far different from those innervating the muscles of the iris, that the former can be set in action without influencing the latter. The hyperæmia of the optic disc, together with the headache and increase of temperature in the right auditory canal, indicates that the same cause which gave rise to the cramp of the ciliary muscle induced indirect vasomotor disturbances on the corresponding side of the head. Of what kind these disturbances have been, whether irritative or paralytic, I dare not say, so much the less as I did not observe the primary effect of the pressure on the carotis. From the fact that the dilatator iridis was not paralyzed, but readily acted on atropine instillation, nothing can be derived in this respect. The sympathetic fibres going to the dilatator pass through the ciliary and intraocular ganglia, and the tonic cramp of the ciliary muscle itself illustrates in this case very well the great influences of these ganglia.

A VARICOSE TUMOR OF THE LOWER LID, NOT VISIBLE WHEN THE HEAD IS ERECT, BUT FORMING A VERY LARGE TUMOR WHEN THE HEAD IS PLACED HORIZONTALLY FOR A FEW MINUTES.

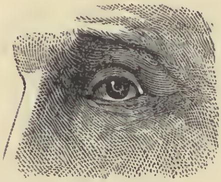
JULIAN J. CHISOLM, M.D., OF BALTIMORE, MD.

(The photographs were taken at the same sitting, No. 1 with head erect, No. 2 after hanging down the head three minutes.)

J. S. N. is a healthy man aged fifty-nine years. Eighteen years since, a discolored spot was noticed at times on his left lower lid, especially after stooping. It caused no pain, and was looked upon as more curious than dangerous. Slowly this spot has enlarged. For the last four years its further increase has not been perceptible. When the head is erect no trace of the swelling is visible, nor is there any discoloration whatever of the skin of the lid. The surroundings of the eye seem in every way normal. If there is any difference in the two sides of the face, the left lower lid looks a little less full than that on the right. The veins of the left temple are larger than those of the right, especially the transverse one which runs towards the external angle of the lid fissure. These, however, are not more conspicuous than are often seen in thin-skinned persons. In other parts of the face no enlarged veins are visible. Vision is good in each eye.

When he looks downwards for a very short time, as when occupied in tying his shoe strings, seeking some object on the floor, or in looking into his plate during a meal, the lower lid of the left eye rapidly swells until it attains the size of a small fowl's egg, encroaching upon the palpebral split, and temporarily shutting in the sight. When the head is lifted the swelling rapidly disappears. While the lid is enlarging the patient experiences the sensation of a warm current of liquid in the lid accompanied by a feeling of distension, but not of pain. To prevent the occurrence of the swelling at night he always sleeps on high pillows and on his right side. On more than one occasion he has been aroused from sleep by the sensation of weight in his lid, and found that he had rolled from the pillow on his left side, with head on a level with the body. On one such occasion, when he must have laid in the horizontal position for a longer time than usual, the swelling remained out for several hours, causing him much anxiety. He dreads a recurrence of this accident, hence he seeks relief.

When I first saw him, after even calling my attention to the seat of the disease, and its nature, I could find nothing in his appearance to indicate a pathological lesion. The eye looked perfectly normal. There was no discoloration about the lid, no swelling, no visible vessels on the conjunctiva, no exophthalmus. I saw a few blue lines of veins in the left temple, but the horizontal one disappeared at the external canthus. These were no larger than I had often seen in healthy persons, and apparently were of no pathological significance. While sitting before me he inclined his body as if to look at his feet, and remained looking down possibly two minutes. In erecting the body I was surprised by seeing in the place of his lower lid a bluish swelling, as large as the first phalanx of my thumb, and sharply defined. The swelling extended from the inner to the outer canthus, involving the entire length of the lower lid. The free border of the lid was overlapped by the swelling, in this way interfering with the pupillary outlook. Its lower border, also well defined, extended half-way down the length of the nose. The definition of the outlines of the tumor was so sharp that it involved entirely but exclusively the lower lid. When the head was hanging down, the face was flushed, and all the veins of the forehead, right and left, seemed enlarged. On rising, all this congestion of the forehead vessels disappeared, leaving the enlarged lid very conspicuous. Pressure



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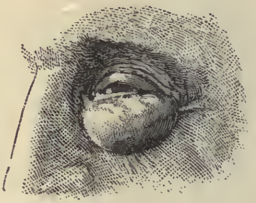

No. 2.

emptied the swelling at once and left no discoloration, nor amplitude of skin, notwithstanding the great distension of the elastic lid covering. The rapidity of development and the equally speedy disappearance indicated an open circulation, and yet no feeding vessels could be detected. I made firm pressure at the inner and outer canthus, upon the rim of the orbit, before the head was hung downwards. It retarded but did not prevent the filling of the eyelid. There was no pulsation in the tumor. When the bluish discoloration was so clearly visible through the thin skin of the lid, there was no discoloration of the conjunctival lining, n proof that the swelling was on the outside of the tarsal cartilage. There was no exophthalamus when the head was depressed, and therefore no complication of the socket veins.

The diagnosis was: a varicose vein of large size, limited to the lower lid—which diagnosis was verified when the operation for the obliteration of the sac was performed. When the seton needle entered the distended tumor at the external canthus, it got into an open cyst as soon as it had perforated the skin and cyst wall. In its passage through the length of the cyst it met with no obstacle whatever until it infringed upon the tumor wall at the inner canthus.

The surgical procedure by which a cure was effected was as follows: When the sac was most distended, a heavy seton composed of several strands of silk thread was passed through the whole length of the sac. The presence of this foreign body was designed to excite plastic inflammation in the lining surfaces of the venous sac. By the end of the fourth day there seemed to be much thickening of the skin, and the presumption was that plastic inflammation had been excited. With the seton left *in situ* the opposing walls of the sac were clamped together by passing three double sutures from the inner face of the lid through the tumor. The threads were secured over a roll of sponge which made direct pressure over the whole outer face of the lid. In passing these lid sutures each thread had two needles, one on each end of the thread. By passing one needle through the upper part of the lid and the other deep in the cul-de-sac, when the two ends of the thread as they appeared upon the face were firmly tied over the sponge, the clamp of thread on the conjunctiva within and the sponge without brought the whole opposing surfaces of the flattened tumor in contact and ensured the complete obliteration of the sac. The presence of these three sutures with the sponge caused so much pain and inflammation, with excessive chemosis, that they were removed with the seton on the third day. The swelling rapidly subsided upon the withdrawal of the threads. A week afterwards the patient was dismissed with the inflammatory swelling nearly effaced.

The patient was heard from six weeks after the operation. The inflammatory thickening of the lid had altogether disappeared, and with it all trace of the swelling. The obliteration of the sac remains permanent.

Much light is thrown upon the pathology of varicose veins by this case. The constant pressure of a column of blood had no part in its formation. The position, a horizontal vein, was not one which gravitation alone could influence; nor could any straining act induce it. There was no hypertrophy of the vascular walls, nor any elongation, with tortuosity of the vessel. The vein is so short a one that no extraneous influence could have been brought to bear upon it. Its location also protected it from injury. The only explanation for its formation was in a primary change of the coats of this short piece of a small vein, diminishing its elasticity and permitting distension under favorable circumstances. At first the tissue changes must have been very limited to produce the small discolored spot which slowly increased in size as the advancing changes in the coats of the vein would permit.

THE ANOMALIES OF THE OCULAR MUSCLES.

By Dr. GEORGE T. STEVENS, New York.

SECOND PAPER.

III.—DIFFERENTIAL CHARACTERISTICS OF HETEROPHORIA AND STRABISMUS.

IN order to arrive at a clear and exact understanding of the nature, importance, and management of the condition to be discussed in this paper we are to keep strictly in mind the difference between heterophoria and strabismus. To this end we may with advantage recall what has already been stated in the preceding paper in respect to the differential characteristics of the two conditions.

In the first of the two classes, heterophoria, binocular vision is habitually maintained but by the expenditure of a greater amount of force than is demanded in the perfect equilibrium of the ocular muscles. In the second class, strabismus, there is habitual diplopia, conscious or unconscious. It is true that, in certain cases of strabismus, fusion of images is possible for brief periods of time and under favorable circumstances, and it is also true that in conditions of heterophoria the tension upon the adjusting muscles is not always exercised to the extent of effecting a perfect and continuous blending of images. Nevertheless the fact of habitual ability or failure to maintain binocular vision should constitute a dividing line between strabismic and non-strabismic affections of the ocular muscles. It is to be admitted that in the general literature of "insufficiencies" the dividing line has not been sharply drawn nor carefully observed. Indeed the term "insufficiency" has, by some writers, been loosely, not to say indiscriminately, used in speaking of well defined strabismic cases. Strabismus may result from insufficiency of certain muscles, but it is to be remembered that an "insufficiency" is not necessarily a strabismus. If these terms may be used in a convertible manner, it is only another reason for the introduction of terms having more precise signification.

Graefe[1] says: "The expression 'strabismus' has a symptomatic signification. It means the inability to unite both visual axes at the same fixed point lying in the common field of vision." And Donders[2] says: "In strabismus the visual lines do not cross one another in the point it is desired to observe." On the other hand 'insufficiencies,' while they are conditions consistent with binocular vision, may, under certain circumstances, become 'relative strabismus' or strabismus only at certain near points. Thus Donders[3] assumes that convergence should occur at 2.5 inches in front of the eyes. Hence should the patient have myopia more than $\frac{1}{2.5}$ there will of necessity result diverging strabismus in reading. Of relative strabismus we shall have more to say in future. In this connection it is only necessary to remind the reader that it is not to be confounded with the more general term strabismus, or absolute strabismus. It becomes, first of all, desirable to find, if possible, some at least approximate indications of the limit of division between the conditions heterophoria and strabismus, or, if I may be permitted a still further extension of terms, between heterophoria and heterotropia. (*Φόρος* a tending; *τρόπος* a turning). Such indications of limitation become necessary if we would express exact meaning by the use of our terms. It is needless to say that if slight cases of strabismus are promiscuously classed with heterophoria our observations and records respecting the two conditions must, necessarily, be imperfect and unsatisfactory.

The determination of the existence or absence of habitual binocular vision is not always devoid of difficulties. In a very large proportion of strabismics the subjects are totally unconscious of double vision, and in another large proportion they are habitually, but not constantly, unconscious. In many strabismic cases the most patient and persistent efforts on the part of the surgeon, perhaps continued through interviews on several days, are required in order to enable the patient to obtain consciousness of diplopia under any circumstances. It is evident, then, that the mere statement of a patient that he does not see double has little value in this connection.

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[1] "*Archive f. Ophthalmol.*, iii., i., p. 177.

[2] "Accommodation and Refraction of the Eye," p. 291.

[3] *Ibid.*, p. 405.

We are, then, to find the means of ascertaining the fact of the presence of diplopia. For this purpose the methods long known to the profession may be, in nearly every case, successfully employed. I shall not here attempt to introduce new methods for reaching this end, but shall suggest some new interpretations of known methods, and endeavor to impress the necessity of a more thorough and systematic employment of those methods than has been indicated by published observations heretofore.

In certain instances in which the deviation of the visual lines is very considerable, yet not sufficient to be manifest to the observer, we may detect the fact of diplopia by the cover test. Unless this test is made with much care it may prove of very little value even in cases of pronounced deviation. While the patient fixes the gaze steadily for a minute or two upon a small object situated at twenty feet distance in the median line, the examiner, seated in such a manner as to obtain a perfect view of the eye to be observed, quickly slips a small card in front of the other eye. If the observed eye is the deviating one, a very slight and quick readjustment of this eye may be seen. This slight movement must not be confounded with a little twitch of the lids which may be seen in some nervous patients at the sudden approach of an object near the eye. Much greater care in observation must be observed than that which is required when, in a case of well marked squint, one places a cover before one eye in order to make a rude estimate of the number of lines of deviation. In a case of steady binocular vision there will be no readjustment of the eyes when one is thus suddenly covered. This is not the well-known test of introducing a cover to observe whether one eye after a moment deviates outward as in insufficiency of the interni. The test, however, is a gross one, and can only be of service in cases of a considerable degree of deviation. It may be urged that in case of a marked tendency on the part of the visual lines to deviate but with power to maintain binocular vision, the tension upon the various eye-muscles would be different when both eyes are directed to the object from the condition when one eye is covered, and that under such circumstances a readjustment of muscular tension would be made when the cover is interposed before either eye. However correct this line of argument may be, I have not found it verified in practice. In cases in which I am able to detect minute adjustments of this sort, I have almost invariably been able to demonstrate double vision by other means. Hence, while this is a rude test for diplopia, it may, in a certain proportion of cases, be a valuable one.

A very large proportion of those who have habitual unconscious diplopia with such moderate deviations of the eyes as to be scarcely noticed by the observer, will recognize the double images when a prism is introduced in such a manner as to change the relative position of the images, even although it may be in the direction of correcting the diplopia or by slightly elevating or depressing one image. Thus one with unconscious homonymous diplopia may be able instantly to appreciate the position of the two images if the diplopia is partly corrected by a prism, or if one of them is raised above the other by a weak prism with its base down. Experience and judgment will be required to enable one to determine how far the prism is instrumental in inducing and how far in revealing diplopia. The method may prove more valuable in enabling the patient to learn the existence of double images under any circumstances than of determining their habitual presence.

By the ordinary use of the prism which shall remove the images farther from their habitual relation, we have another means of forming a judgment respecting diplopia.

If with a prism, with its base in, we cause conscious diplopia in the manner already described for detection of hyperphoria, we may determine the manifest deviating tendency from the horizontal plane. If now there were an absolute and uniform degree of such manifest tendency within which habitual blending of images could be assumed and beyond which diplopia could be confidently expected, it would be comparatively easy to settle the question of single or double vision in the vertical direction. I know of no such absolute line of demarkation. Nevertheless we may make some approximation toward a line of limitation. In the orthophoric state the eyes are able to unite images when a prism of 2° to 3° is introduced with its base up or down before one of the eyes. The power to go beyond this is very rare in cases of well-balanced eyes. This, then, marks, approximately, the limit of uniting images in this direction in such a condition. But in hyperphoria, the habitual effort on the part of the patient to force the eyes into proper relations will so develop the strength of the muscles engaged as to enable one to maintain single vision with a deviating tendency of rather more than this. Beyond a manifest deviating tendency of 3° or 4° in this direction,[1] then, we may reasonably expect that the ability to maintain single vision continuously is lost; especially may we infer this if we find associated with this tendency an important deviating tendency in the lateral direction. Thus one who would manifest at twenty feet a tendency of one visual line above the other of more than 3° or 4° and of the lines outward of, say from 6° to 10°, would, with scarcely a doubt, be unable to maintain single vision, although such a person might be able to obtain it for a brief period at a time. I have not met with any case in which, with diplopia under the influence of a horizontal prism, the images deviated from the horizontal plane more than 5°, habitual binocular vision has been maintained. To speak of hyperphoria, or non-strabismic "insufficiency of the inferior recti" of 10° to 15°, is, without doubt to employ such terms in an extravagant and irrational manner.[1]

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[1] This is not to be confounded with sursumduction, which may reach 9° or more in myopia.

In a similar manner, if the deviating tendency in the lateral direction is more than the usual ability of the muscles to overcome in the direction opposite to the tendency, a presumption exists that binocular vision is not habitually maintained. The usual power of the abducting muscles in orthophoria is measured by a prism of about 8° or possibly 9°. A deviating tendency of considerably more than this would be inconsistent with single vision, except by the development of the strength of the abducting muscles beyond the physiological standard. Making due allowances for this, it would certainly demand an inordinate and, in the great majority of instances, impossible tension on the part of those muscles to maintain continuous fusion of the images in any case in which the deviating tendency inward should be shown to exceed the usual abducting power. Should it be found in an individual case that with a deviating tendency inwards of rather more than 8°, as shown by a prism with its base down, there should exist an unusual degree of abducting power, the eyes might ordinarily be adjusted for single vision. If, on the other hand, the abducting power should be found to be rather less than the usual standard, making due allowances for all collateral influences, it would be reasonable to assume that binocular vision cannot in such a case be regularly maintained. The proportional power of holding binocular vision at a distance in the deviating tendency outward is less than in the opposite direction; for whereas the fusion-power of a patient with a tendency of the visual lines inward may be equal to or slightly in excess of the usual power of abduction, one with a tendency of the lines outward will see double, at a distance, with a deviating tendency of much less than the usual adducting force as measured by prisms. In orthophoria, with or without a little practice, most persons will overcome prisms with their bases out equal to about 50°. But a deviating tendency outward of much less than one half of this amount will be associated with an inability to hold images single during any considerable period of time. Making allowances for rare exceptional cases, my observations have led me to believe that a deviating tendency of 8° or more (at 20 feet) is inconsistent with single seeing. If, in an individual instance, the tendency of the lines is to deviate both in the vertical and in the lateral direction, the task of uniting the lines at the point to be observed becomes still greater. It happens, more frequently than otherwise, that a manifest deviating tendency outward of more than 6° or 20 feet is associated with inability to hold continuous union of the visual lines at that distance and much less at nearer points.

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[1] Reports of cases of non-strabismic "insufficiencies" of the superior or inferior recti, for which the patients were required to wear prisms of 12° or 15° or even 20° with the bases up or down, are but grotesque illustrations of prevailing misconceptions in respect to the extent to which "insufficiencies" can exist before reaching the point of strabismus.

Again, in respect to the terms in use: If the ordinary power of the inferior rectus is sufficient to overcome momentarily a prism of 3°, the employment of the term "insufficient" to one which is supposed to habitually overcome a defect equal to 20° prism is evidently an inconsistency.

A third method of detecting habitual failure to maintain binocular vision, is by so reversing the ordinary experiences of the visual sense as to bring into consciousness the existence of the extra images which have become by long practice mentally suppressed. This may be accomplished by the well-known device of introducing in front of one of the eyes a glass whose color shall be in strong contrast with the object upon which the gaze is directed. We may use a lighted candle placed at the distance of 20 feet, or more, from the patient, and at which he gazes, in a darkened room, or against a darkened surface. If diplopia exists, it may be manifested when a red glass is placed before one of the eyes. The fact that it is not manifested does not of necessity show that there is single vision, for the habit of a lifetime of suppressing one image may be too strong to be thus easily overcome. In a great many instances of inveterate squint, the difficulty of inducing the patient to recognize double images in this manner is extremely great. It often requires great patience and persistent effort, continued through many interviews on successive days, with the assistance of considerable ingenuity on the part of the surgeon in throwing the image in various directions by means of prisms while the red glass is maintained in position, before a confession of double images can be obtained. Success will always crown persistent and intelligent effort. When once the patient has learned to apprehend the sensation of double images, little trouble will in general thereafter be experienced in locating them.

The presence of double images at this distance as shown by the colored glass is presumptive of habitual diplopia. Nevertheless, it may be urged that by giving the images different colors there is a modification of the instinctive demand for binocular vision, and the tension is so relaxed as to allow the images to separate. We are then to inquire to what extent this principle may be true. Observations conducted during several years and on a great number of cases have shown that the ability to maintain binocular vision, while a red glass is before one of the eyes, is less ordinarily than in its absence. How much less we will proceed to inquire. If one who has the ability to overcome a prism of 8°, with its base in, places a plain red glass before one of the eyes, his power of abduction will usually reach only 7°. If his power of adduction without the red glass is 50°, he will lose with its presence about the same proportion of his adducting power and will be able to adduct usually not more than about 45°. It thus appears that the influence of the red glass in orthophoria may be rudely estimated as being equal to about one eighth of the abducting or the adducting power. In examinations of those in whom heterophoria exists, the rule appears to hold good. It is to be seen, therefore, that the influence of the red glass in manifesting diplopia is, except within very narrow limits, entirely in the direction of revealing that which exists, rather than permitting diplopia to occur which would otherwise be avoided. Experience leads me to believe that a vertical deviation of a single degree as shown by a red glass is more than a patient will ordinarily overcome without it, and that habitual double vision is the rule when diplopia, as shown with a red glass which demands a prism of more than 1° or 2° for its correction, is found in the lateral direction. Indeed, diplopia with a red glass indicates the extreme limit of single vision without it. It is to be remembered that in such an examination the patient is on the alert and is making his best efforts at fusion of images. If this statement should appear extreme, I believe it would not so appear after careful examination of the subject. I have found that patients having diplopia with a red glass corrected by a prism of 1° or 2°, will, after their attention has been repeatedly drawn to the phenomenon, become conscious that this is the habitual condition under ordinary circumstances. They may be able to unite images momentarily, but ordinarily the two images are not united. We may summarize these three methods of detecting the presence of habitual diplopia which appear to be most useful as follows:

1. The gaze of the two eyes being directed upon a distant object, the presence of diplopia is shown when the line of vision of one eye being suddenly interrupted by the interposition of a screen, the other eye is seen to make a movement for readjustment.

2. When conscious diplopia is caused by a prism, if the manifest deviating tendency in the vertical direction exceeds 4°, diplopia may be suspected, and the suspicion is made almost a certainty if combined with this there is a lateral deviating tendency of as much as 6°. If the deviating tendency in the lateral direction inward is shown to be more than 10°, or outward more than 8°, it is probable that binocular vision is not maintained.

3. If with a red glass before one eye diplopia is shown in the vertical direction, habitual strabismus exists. If diplopia is shown in a lateral direction strabismus is indicated if a prism of more than 1° or 2° is required to unite the images.

It will thus appear that while we have no absolute boundary between heterophoria and strabismus an approximate limitation may at least be found, and by patient investigation in individual cases we shall be able to make a practical diagnosis between the two conditions. It will hardly be exaggerating to say that diplopia as shown under the influence of a red glass may under almost any circumstances, be regarded as an indication that binocular vision, if obtained at all, is not habitually maintained. This is perhaps the most practical line of division between strabismus and heterophoria, but it is one often very difficult to find.

I have already[1] called attention to the methods of proceeding in recognizing and treating one of the forms of deviating tendency less than strabismus, hyperphoria. I shall now direct attention to the second in importance, esophoria.

For determining heterophoria, especially hyperphoria, exactitude in the methods of making examinations is of greatest importance. With the view of securing accuracy and of saving time I have devised a phorometer which is here shown.

The instrument consists of the standard A, supported by a tripod. The standard is freely extensible, permitting a ready adjustment for differences in stature of patients. The arm B is grooved, and allows the carriers C and D to rest securely, to slide freely from end to end of the arm, or to be removed at will. At E a spirit-level is attached to the arm, by means of which the horizontal position of the arm can be determined. The semicircular piece at the head of the arm is spirally toothed and is acted upon by the endless screw at F, which imparts to the arm an upward and downward elbow movement. The semicircle is graduated in degrees, and a fine pointer indicates the extent of motion imparted by the screw. By means of the lever G, the screw can be unlocked, allowing the arm to fall to the side of the standard. Of the two prism-carriers one carries two prisms placed horizontal, with their bases in, and of sufficient strength to induce homonymous diplopia. The prism D is placed with its base down and is used for determining lateral tendencies. The rod H carries a tablet I, on one side of which is a small cross and on the other side another cross somewhat larger. The tablet is reversible, and the crosses are used as objects in determining the tendencies in accommodation. The tablet is, when brought into position, one half metre in front of the prism; but by means of a fixation screw it can be brought nearer if desired.

When not in use the rod is parallel with the arm. As has been intimated elsewhere, in the determination of the tendencies of the visual lines much freedom may be given to the position of the head without material effect upon the position of the images, provided the prisms are independent of

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[1] Arch. of Ophthalmology, vol. xvi., 2, p. 115.

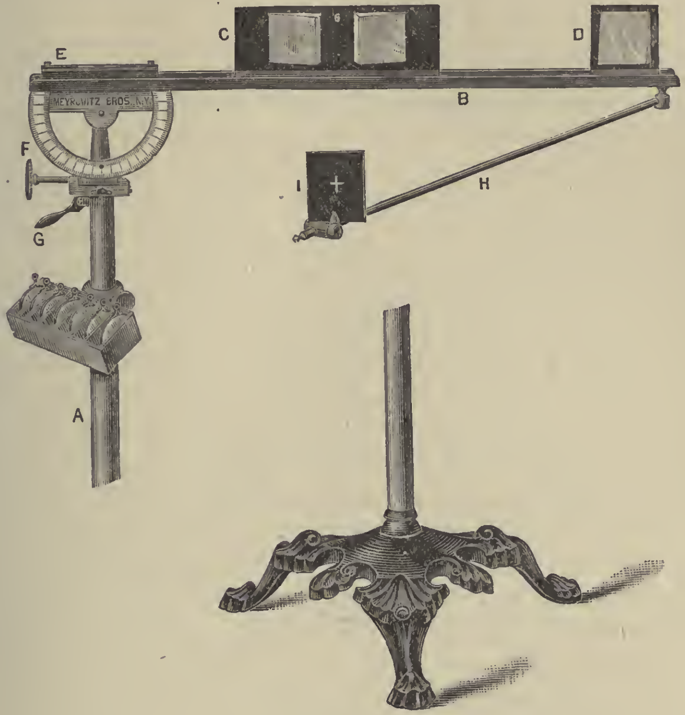

FIG. 1.

the head and somewhat removed from the eyes. This does not hold good in every case, but the exceptions are somewhat rare, and the presence of the exceptional condition can be quickly ascertained.

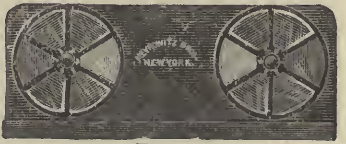

FIG. 2.

Fig. 2 represents a pair of revolving disks in a carrier adapted to the phorometer; each disk consisting of six prisms with the bases in. The two openings permit the two eyes to see from behind. By pressing upon the milled edge of either disk, prisms of different strength can be brought before the openings. The numerals in the figure show the strength of the various prisms. This little device I find very convenient and time-saving in the determination of the power of abduction. A series of prisms for adduction is similarly constructed.

IV.—ESOPHORIA.

The method of determining esophoria has been already shown in the former paper. The prism of about 6° is placed before one of the eyes with its base downward or upward, and the patient's gaze is directed toward a lighted candle situated in the median line at the distance of twenty feet. Should the double images now appear exactly in the vertical line, no tendency to deviate in the lateral direction is shown. The test should not, however, be abandoned at this point. While maintaining the vertical prism in position, a very weak prism may now be placed with its base alternately in and out before either eye, when the relation of the double images is again to be observed. Should the images remain in the vertical relation the strongest prism which can thus be interposed without causing a deviation of one or the other image is placed before one of the eyes and the result is recorded as esophoria or exophoria as the case may be of $0° < n°$. If with the prism, its base down, the images deviate homonymously, esophoria is indicated; exophoria being shown by heteronymous deviation. If, for instance, the prism is placed with its base down before the right eye, the higher image will be that of the right eye. If this image is at the right of the lower one, there is homonymous deviation showing esophoria, but if the higher image should be found at the left of the lower, heteronymous deviation indicating exophoria is shown. In order to measure these deviations with accuracy the prism must be held with its base precisely downward, but we may estimate a deviation by turning the prism a certain number of degrees from the primary position, the strength of the prism and the amount of the turning being known (Graefe).

This test with the vertical prism having been made at the distance of twenty feet, the power of abduction is then to be determined. As stated in the previous paper, the standard of normal abduction should be about 8°. But the failure to overcome a prism of 8° with its base inward at a distance of twenty feet does not prove that the visual lines actually tend inward, nor does the ability to overcome prisms of higher grades show that these lines tend outward. This restriction of abduction power on the one hand, or its excess on the other, while under ordinary circumstances indicating a tendency inward or outward of the visual axes, in a certain proportion of cases may be the manifestation of some complicating tendency. Hyperphoria, for instance, not unfrequently gives rise to irregular abducting energy. In a case in which hyperphoria of 1° or 2° may be found, esophoria of several degrees may be shown by the test of the vertical prism, while the abducting power may reach 12° or more. On the other hand, the vertical prism may show 2° or 3° of exophoria while the abducting power may be restricted to 4° or 5° which cannot be increased by any adjustment of the prisms to favor the hyperphoria. An operation for hyperphoria will, often but not always, bring these conflicting evidences into harmony. Not every case, however, appears to be thus explained. In a certain number of instances we find restricted abduction with exophoria, or excessive abduction with esophoria, and no other complicating tendency appears to manifest itself even after patient search continued through some months. In general, esophoria is attended with restricted abduction, and as a rule we may accept the fact of inability to overcome a prism of 8° with its base in as indicating an inward tendency of the eyes, unless exophoria is positively shown by the vertical prism.

The test for esophoria having been made at the distance of twenty feet, it should be repeated at the near point. A convenient form of test object is a small cross. The vertical arm of the cross serves to give an idea of the relative position of the images, but does not, like Graefe's dot-and-line test, conceal the deviating tendency by the effort to fuse the double parallel lines. If at the near point the images still deviate homonymously, we have esophoria in accommodation. It not unfrequently occurs that esophoria is shown when the test is made for the distant point, and that exophoria appears by the test in accommodation. Here, as in the case of inconsistencies between the esophoria and abduction tests, hyperphoria is to be suspected. It is likely in this latter case that the influence of the superior muscle in causing the upward tending of one eye gives rise to a swinging movement, which is shown as exophoria in accommodation. I have elsewhere[1] discussed at some length the theory which has been rather generally held, that in these cases "insufficiency" of one set of muscles exists for one distance, and "insufficiency" of the antagonizing set is the condition for another distance. It is to be admitted that all muscles may be weak. It may therefore be admitted that both the external and internal recti may be weak. Are we therefore to assume in every instance, or in any considerable proportion of instances, in which opposite results were found by tests at different points, that when one looks at an object situated at twenty feet there is "insufficiency of the externi," in the sense of too little power to antagonize the interni, while at the near point there is "insufficiency of the interni," in the sense of inability to antagonize the externi? We may find assistance in answering this question, in many instances, by ascertaining the relative power of the opposing muscles in abduction and adduction. Let us take an example which fairly represents a very large class of cases.

Let us suppose that, in our example, a not uncommon one, by the vertical prism we find esophoria 4°, and in accommodation exophoria of 7° or 8°. By abduction the patient overcomes a prism of 8° or even 9°. This abducting force is equal to the ordinary standard, and therefore indicates no weakness of the externi. They can overcome the tension of the interni from the position of equilibrium to an extent as great, or even greater, than the average muscles of their class.

On the other hand there is a power of adduction of 50°. This indicates equally that there is no "weakness" of the interni or failure of power to act when the question is one between these and their immediate opponents. It is true that there may be a good abducting power coincident with a tendency of the visual lines inward, and the proposition holds good respecting the opposite conditions; but, taken together, the theory that both these opposing sets of muscles are alternately "insufficient" for the other is wholly illogical. We have in our case adequate power of abduction, showing that there is no essential "weakness" of the externi, and full adducting power, proving that the interni are supplied with ordinary strength. With esophoria at distance and in accommodation we might readily and logically conclude that, with full power of each of these opposing sets of muscles, a relative inequality of length of the muscles, or an imperfection of adjustment, would account for the inward tendency; and the same might be said of exophoria at the far and near points under similar circumstances. I hold it absolutely illogical, in view of such facts, to retain the idea of "insufficiency" of both sets of muscles in such cases as that used in the illustration. We must seek for a more reasonable explanation. This, as already stated, I have found in a very considerable proportion of cases in the fact of the existence of hyperphoria. As in the class of cases already cited, in which hyperphoria gives rise to irregularities in the abducting or adducting power, so it is often, if not usually, the complicating element in these contradictory cases in which esophoria is found at one point and exophoria at another. It is not always easy to discover the hyperphoria in these cases. It may elude discovery during several examinations, but the presence of the contradictions under discussion should, I believe, always suggest the existence of hyperphoria. Not until that or some equally important element of disturbance is found should we rest in the belief that we have discovered the actual tendency of the visual lines.

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[1] Transactions International Medical Congress, Washington, 1887.

These contradictory conditions include a very large class of cases, and, unless studied from a proper standpoint, a class of cases presenting very great difficulties, both as to diagnosis and treatment.

In a certain number of cases I have been able, after long-continued search, with failure to discover the real muscular balance, to find the faulty tendencies, after faithfully excluding one of the eyes during some days or weeks. In order to be effectual, the exclusion must be nearly perfect, and the patient must not indulge in the occasional use of both eyes.

The results of this method are to be accepted with great caution, rather as suggestive than conclusive.

It is well known that it is not unusual that one eye, the vision of which is lost by disease or injury, will turn outward. This happens in so large a proportion of cases that it cannot be supposed to be in most instances the result of any original-balance of the eyes outward. In like manner, after excluding an eye for one or two weeks, we may find a marked condition of exophoria, which will correct itself after a return to the use of both eyes. Notwithstanding the uncertainty of value of results obtained by the exclusion of one eye, it is a method which in a small proportion of cases has led to information which I have not been able to obtain otherwise.

If we inquire concerning the position which the condition esophoria has occupied in the literature of ophthalmology, we shall find that it has received far less attention than that to which its importance has entitled it. There has existed in the profession a vague and possibly not very fortunate tradition that " insufficiency of the interni " constitutes, excluding strabismus, the important anomaly of the ocular muscles; and this condition has been elevated to an unmerited prominence at the expense of other muscular defects equally if not more deserving of attention than itself. The school of Graefe has, for more than twenty years, dominated in this field of inquiry, and Graefe looked upon the task of adjusting the eyes in the act of reading or working with the hands, as holding a pre-eminent importance. It is no disrespect to the great name of Graefe to assume that this view was and is much too limited. It is not disparaging the consummate abilities or the value of the teachings of this leader in thought to believe that, when all these muscular anomalies have been more fully considered, the condition which principally occupied Graefe's attention in this connection will be looked upon as that holding the lowest rank of the group in importance.

In Graefe's extensive treatise on muscular asthenopia, his most important reference to "insufficiency of the externi" is included in the following brief paragraph:

"There is another cure for asthenopia based on the storing of the relative range of accommodation. If we weaken by a tenotomy of the internus, the power of action of the latter in a proper manner, so that the proper convergence of the eye in question continues (and this result may be easily reached by tenotomy with the conjunctival suture), then a given degree of convergence is accompanied by a higher degree of accommodation than before. And corresponding with this will be an approach of the relative accommodation to the near point.

"The demand on the energy of accommodation then becomes less. We have produced an effect nearly equal to that which we produce by placing a prism with its edge in, producing voluntary squinting, or as though the patient had squinted for his own relief.

"It is essential to consider, however, in this connection, that by enfeebling the interni beyond a certain measure (even through the use of an adducting prism) we induce slight muscular asthenopia."[1]

Graefe says he has resorted to this expedient only twice, and then only in cases where experiments made with prisms (colossal prisms) showed that they were overcome by adduction, giving him the surety that no troublesome insufficiency would result, and where, besides, a very evident movement of the relative range of accommodation had been shown beforehand.

Graefe adds: "In any case the method remains more interesting than practical in comparison with the more peaceful choice of spectacles."

Even here it will be seen that the aim was to secure an approach of the relative range of accommodation to the *absolute near point*; in other words to obviate difficulties arising at the reading distance. It is impossible to form a judgment of the precise condition which was found in these two cases, or the exact result of the operative measure; but it appears certain that Graefe found little encouragement in this method of treatment, since he came to regard it as interesting rather from a theoretical than from a practical point of view.

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[1] *Arch. f. Ophthal.*, viii., 2, 321.

There is in this little reference to the preponderance of the interni, no solicitude for the equilibrium of the long muscles when the eyes are directed to a distant object, nor for any absolute adjustment of the visual lines at various points; the burden of this paragraph is that with certain efforts at accommodation, especially in hypermetropia, there may occur a slight convergent squint, which influences the relative range of accommodation. This, he says, may be relieved by tenotomy, not graduated to secure equilibrium at the point of least enervation, but enough in the judgment of the operator to prevent insufficiency of the interni at the same time making a higher degree of accommodation necessary than before.

This view cannot in any respect be classed with the view of esophoria which has been advanced in the preceding paper or in this. It is an expedient for the relief of or rather for the exercise of the accommodation, not a remedy for esophoria.

To illustrate the disregard of Graefe for any "insufficiency of the externi," less than positive strabismus, I shall quote at some length, from his great article on asthenopia, his remarks upon the graduation of the extent of the tenotomy in operations for "insufficiency of the interni."[1]

"As point of departure (for the graduation of the tenotomy) we must choose according to the *reading distance* of the subject. . . .

"If we should even do a little too much, it would not at the near point cause the least trouble. Strabismus convergens could only occur *if we have exceeded the measure of the total abduction* of which the insufficiency constitutes by far the smaller part. This would be a great mistake. Should we keep within this measure (in over-correction of the insufficiency) then the correction would for the near point be reached the more easily, and at most the disadvantage would be the too great reduction of the relative range of accommodation." In discussing further the results of over correction he says:

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[1] *Loc. cit.*, p. 349.

"There will then become necessary at the distance a tension of the externi. This in itself is, fortunately for the tenotomy, of no consequence; as, for the act of vision at the distance the same results from continuous strain do not occur. Against this however occurs a real trouble. If in the main, the power of the externi is no longer sufficient for fixation at the distance, strabismus convergens with homonymous diplopia is the result. When, in brief, will this occur? Necessarily if the definite effect of the tenotomy does not correspond to the extremest abduction for the distance. We therefore find the measure for the tenotomy by ascertaining the strongest prism which can be overcome by divergence for the distance. The linear deflection which corresponds to this prism, we can remove without harm in order to take from the interni, at the near, as much work as possible. After such an adjusted tenotomy, binocular fixation for the distance takes place, of course, with the *greatest strain* for the externi. What is then required of the externi for the distance favors the interni at the near point. If we had taken only the insufficiency for the distance and not the total abduction, then we would have unnecessarily sacrificed to an illusory advantage for the distance (tension of equilibrium) a part of the real advantage for the near."

Respecting the above, Graefe says: "I have here spoken of the permanent effect. The temporary one may be even considerably greater. We may exceed without harm the abduction for the distance by from two thirds to three fourths of a line, so that there will result, in the median line for the distance, homonymous double images which are united by a minimum prism of 10°."

Graefe adds that he has often operated to such an extent that prisms of from 15° to 20° were required, not to correct the insufficiency of the externi produced, but to unite the double images resulting from the temporary converging strabismus. In his illustration of the different grades of the affection and their treatment he says: "Let a second patient have at the near point insufficiency (prism) 16°, at the distance insufficiency (prism) 6° with abduction (prism) 16°. We can take from him by tenotomy the full insufficiency for the near, as that is equal to the abduction at the distance; thus he will now be just able to fix for the distance, *though with greatest possible strain of his abducting power, to which, as we have already found, there is no objection.*" Even when the abducting power is no more than 4° Graefe still recommends weakening of the externi to the point of complete abolition of the abducting power.

It will thus be seen that any insufficiency of the externi short of actual converging strabismus was regarded by Graefe as a matter of no consequence, provided he could secure less of tension at the reading distance.

Indeed, herein is found a radical difference between the system taught by Graefe and that which has been pointed out in these papers, as well as in my former writings. Graefe sought to adjust the eyes for the near point at any sacrifice of the relations of the visual lines at greater distances short of absolute diplopia. His examinations at a distance were not in the interest of actual equilibrium of the ocular muscles, but in respect mainly to the question of how much could be sacrificed in the effort to establish binocular vision at the reading point. In the system here presented, perfect equilibrium, in all respects, in vertical as well as lateral directions, and at the point of greatest relaxation both of the directing and accommodating muscles, is the end to be attained, in the expectation that, this being established, easy adjustments will result at all points, near and distant.

The great majority of text-books completely ignore non-strabismic insufficiencies of the externi, muscular asthenopia and insufficiency of the interni being synonymous terms. Thus Soelberg Wells[1] devotes a section to the discussion of "Muscular Asthenopia (Insufficiency of the Interni)."

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[1] "Diseases of the Eye."

His tests for the affection are all made at the near point, the principal one being the dot and line of Graefe. In determining abduction and adduction he removes the object to a distance of from six to ten feet.

Galezowski[1] discusses "Latent Divergent Strabismus, or Muscular Asthenopia," and says that muscular asthenopia is due to "insufficient contractile force of the internal recti." His only test is the dot and line, and made at a distance of fifteen centimetres from the eyes. The third edition of this work, very recently issued (1888), advances no change of view.

Landolt[2] defines muscular asthenopia as "insufficiency of the internal recti muscles." In his later writings[3] he lays much stress upon insufficiency of the converging force, but does not consider the effect of insufficient diverging power or of insufficiency of the externi.

Stelwag[4] says: "The immediate cause (of asthenopia) is *always* the overburdening of the muscle of accommodation, or of the *internal recti*, as the case may be." In a single sentence in one edition there appears a recognition of "insufficiency of the externi" as a possible cause of asthenopia.

Schweigger, in his work on "Squint,"[5] devotes a chapter to "Muscular Asthenopia," which he attributes solely to insufficiency of the interni.

Without further reference it may be said that these representative works fairly indicate the importance attached to the condition we are now discussing, and that they indicate that no significance was attached to the condition, except in a single instance, where a brief reference agrees with Graefe's view that an insufficiency at the point of strabismus might become an element of disturbance of relative accommodation. Even this limited and wholly inadequate view was, by almost universal consent, relegated to the realm of the impractical.

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[1] "Maladies des Yeux" (first edition), pp. 739 and 789.

[2] "Manual of Examinations of the Eyes"; translated by Burnett.

[3] "L'Amplitude de Convergence," 1885; "Insufficiency of the Power of Convergence," 1886; "Refraction and Accommodation of the Eye," 1886.

[4] "Diseases of the Eyes."

[5] London translation, 1887.

I have seen nothing in the literature of ophthalmology, until attention had been called to the subject in my own writings, which, in any degree, controverts this opinion of Graefe. It is true that there occur, in great rarity, references to the condition of insufficiency of the externi; but, as the cases which have been cited as illustrations are only moderate cases of strabismus, such as under the definition of esophoria given above would be excluded, it can scarcely be said that the subject has received any attention at all. Cases in which diplopia is manifested at the distance of twenty feet, upon the introduction of a colored glass before one of the eyes, even should that diplopia not exceed 2° or 3° can hardly, by any process of logic, be regarded as included within the limits of esophoria. And the fact of the presence of diplopia, even in smallest degree, is a fact presumptive of habitual failure to unite images, for, during an examination, with the attention of the patient closely fixed upon the object, he is likely to make his best efforts, and if he fails in this, it is highly probable that he does not succeed under ordinary circumstances.

In a paper on *Oculo-neural reflex irritation* read at the International Medical Congress at London, August, 1881, a case was reported in which tenotomy of one of the internal recti muscles had been made in which an insufficiency of the externi of only 2° at twenty feet existed. The patient immediately after the operation had no insufficiency, and was able to overcome a prism of 10° by adduction. The patient had been an epileptic, and an entire relief from epileptic seizures had followed the operation. I may add that relief continues to the present time. At the same Congress in another paper, a similar operation for a similar condition was reported, in which the most marked relief had followed in a case of nervous disease. In an essay presented to the Royal Academy of Medicine of Belgium, December, 1883, I reported having at that time performed operations for this defect in three hundred and fifteen cases, and many of those cases were given in detail. Up to the present time I have performed this operation for the relief of esophoria in more than two thousand cases.

In respect to the clinical importance of esophoria, which occurs in the proportion of more than three to one of exophoria, it plays a much more important role than the latter as a predisposing cause to a variety of neuroses; and, as the immediate cause of asthenopia and kindred affections about the eyes, it is an element of great disturbance. It is probably true that in an individual case of exophoria, the strain in adjusting the eyes may be more immediately expressed in the orbit in the form of localized pain of the over-strained muscles than in an average case of esophoria of equal extent. The reactions of esphoria are likely to be more distant. Thus, the patient affected with exophoria may, after an hour spent in reading, suffer from pain in and immediately about the orbit. On the other hand, the patient affected with esophoria, after attending church or the opera, or after visiting a picture gallery, where the eyes have been directed during a considerable time at a distant point, and in such position as to hold the visual lines in parallelism, the result is quite likely to be a universal malaise, with pain at the back of the head and in the upper part of the neck, and possibly, if the patient is not strong, a sense of illness all the following day.

Reviewing a large experience in comparing these two conditions, I find that the general or distant reactions from esophoria are far more frequent and significant than those of exophoria, and that the local pains, while possibly absent in a greater proportion of cases, are still of great prevalence and of a more persistent character when existing.

The grade of the deviating tendency does not always mark the extent of irritation resulting from it. Indeed, these anomalies of the ocular muscles sometimes result in less serious reactions when extreme than when moderate. Thus, in a case of esophoria or exophoria of 2° or 3° the defect is sometimes a source of greater irritation than one on the verge of strabismus, of 8° or 9°; because in the first instance binocular vision is constant, or nearly so, although effected by strenuous effort. In the second case the image of one eye is often suppressed, and the eye is permitted to drift away from the physiological companionship of its fellow; thus affording a rest of one kind at the expense of another sort of nervous perplexity. This principle is sometimes illustrated after operations in cases of complicated strabismus. If a patient who has, for instance, a widely divergent strabismus with moderate deviation of one eye above the other, is subjected to an operation for the correction of the divergence, the patient at once becomes annoyingly conscious of double vision, and this consciousness remains until the correction of the vertical deviation is made. Of course such a patient had never been free from double vision previous to the first operation, but the consciousness and annoyance only arose when the double images were brought into very close proximity.

It is not an uncommon circumstance that, of two members of the same family having similar tendencies of heterophoria, the member manifesting the lesser defect is often the one to experience the most serious nervous reactions. It does not follow that the latter of the two mentioned has actually less anomalous tendency than the other, but such a one by a more strenuous effort may conceal what the other reveals, and by this very effort induce the nervous disturbance.

It is not to be supposed that because esophoria is more often than exophoria the predisposing cause of distant disturbances, it is therefore not a notable cause of asthenopia. Of a large class of cases which go from one oculist to another in the hope of relief from some new treatment and submit to an almost endless change of spectacles with little if any advantage, a very considerable number are victims of very slight grades of esophoria. They gain no relief until this too much neglected anomaly receives due attention, when their asthenopic symptoms disappear.

To the ordinary phenomena of asthenopia may be added the following symptoms which are prominent among the local indications of esophoria.

In a certain proportion of cases, especially those in which esophoria approaches the extreme limits to which binocular vision can be maintained, the accommodation is suppressed in order to avoid too excessive convergence at the near point; the patient preferring an imperfect accommodation, and hence an indistinct image, to a more perfect accommodation with loss of perfect union of the images of the two eyes. The habitual suppression results in weakened power of accommodation, which is often associated with a widely dilated pupil. Even after an entirely successful operation for the relief of the esophoria, the accommodation sometimes remains enfeebled and the pupil sluggish and expanded for many months, continuing the symptoms of asthenopia and headache.

In esophoria, especially when combined with hyperphoria, one of the very unpleasant symptoms not unfrequently met with is the annoyance experienced by the patient in constantly seeing the nose. This may appear a trivial symptom, yet it is described by those subject to it as a most vexatious phenomenon. Many patients declare that they can bear the pain of the head and back resulting from the muscular condition better than they can endure the never ceasing annoyance of seeing the nose.

In similar conditions patients not unfrequently complain of seeing a black spot in the centre of the field of vision. Thus while reading, a black spot is frequently present at or near the part of the page at which the reader is looking, causing annoyance and confusion. This black spot would appear to result from a temporary failure of the visual lines to unite at the desired point, permitting one eye to float inward to an extent that the blind spot appears at the reading point.

The effect of esophoria on vision, while, in the lesser degrees, not so pronounced as that which has been shown to result from slight grades of hyperphoria, is, in moderately high degrees, of a most unequivocal character.

Amblyopia has been shown to be rather the rule than the exception in hyperphoria. In esophoria, amblyopia is the rule when the deviating tendency exceeds 2°. The visual condition of 100 consecutive uncomplicated cases of esophoria was examined with the following result: no case in which hyperphoria of 1° existed, or in which hypermetropia or myopia exceeded 3.00 D, or in which astigmatism of more than 1.50 D was found, nor any case of disease or injury being admitted to the list.

In these 100 cases the average vision of the 200 eyes (no case being recorded at more than $\frac{20}{20}$) was equal to a small fraction less than $\frac{20}{20}$. It thus appears that in slight grades of esophoria the tendency has little if any influence upon the state of vision.

In 100 other cases in which the degree of esophoria was not less than 3° or more than 8°, the vision is shown in the following table. In these cases, as in the first series, all complicating deviating tendencies were excluded, and the restrictions in regard to disease or injury and in regard to refraction were the same. The table shows the number of best eyes and of worst eyes having certain grades of vision from $\frac{20}{20}$ to $\frac{20}{100}$. In each case one eye is reckoned as best and the other worst, even when both were of similar grade.

TABLE:

Vision.	Best Eyes.	Worst Eyes.
$\frac{20}{20}$	36	28
$\frac{20}{30}$	46	39
$\frac{20}{40}$	15	23
$\frac{20}{50}$	2	4
$\frac{20}{70}$	1	2
$\frac{20}{100}$ to $\frac{20}{100}$	—	4
	100	100

It appears from the above table that the average vision in esophoria of more than 3° is materially reduced, and that:

The average vision of 100 best eyes is about $\frac{20}{27}$.

The average vision of 100 worst eyes is about $\frac{30}{50}$ or $\frac{20}{35}$. In other words, the average loss of visual power of the 100 best eyes is nearly $\frac{1}{3}$, while the average loss of the 100 worst eyes is nearly $\frac{1}{2}$.

It is only reasonable to suppose that a condition which must of necessity act as a constant cause of nervous perplexity and irritation, should result in inducing a state of hyperæmia or of altered nutrition of the parts supplied to a certain extent by branches of the same nerves which supply the imperfectly balanced muscles. It could scarcely happen that an irritative cause so prolonged in its existence and so efficient in inducing functional disturbances should fail to be a frequent cause of such perverted nervous influences upon the eyes themselves or their immediate surroundings as to promote pathological changes of divers forms. Hence, for instance, it is not a surprising fact that one who, during a lifetime, has contended with the irritating influences of heterophoria, should at length find that the nutrition of the crystalline lens has suffered degenerative changes, or that even the tunics of the eye should be affected unfavorably. This view of the possible or probable origin of many affections of the eye is not one to be regarded with disdain or treated as the outgrowth of extreme views. Diseases do not usually occur spontaneously. They are the result of laws, and it is idle for us to speak of cataract or corneal ulcer or of various other affections simply as accidental or providential visitations ; and a fallacy to talk about "constitutional causes," when we mean that we do not know. A known cause which may induce perverted nervous action is of more practical consequence than a volume of profound ambiguity. Many years ago I called attention to the influence of refractive anomalies as predisposing causes of corneal ulcers,[1] and I have since had the satisfaction of observing that several close observers have arrived at similar conclusions. I cannot doubt that refractive and muscular lesions are very largely effective in the causation of various eye affections both internal and external.

True there are certain well-known general physical contaminations which are manifested as local affections ; but even in the presence of these sources of unmitigated evil we may learn that the localizing of the virulence is favored by a damaged or enfeebled state of the nerves supplying the affected part.

Hence in many chronic and obdurate affections of the eye we may look upon the conditions of anomalies of refraction and of the eye muscles as probable sources of mischief.

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[1] Transactions International Congress, Philadelphia, 1876.

Should a case of incipient idiopathic cataract present itself, and should I find associated with it pronounced anomalies of the eye muscles, I would most surely advocate the rational treatment for these conditions. Would the cataract stop? Perhaps not. But in many cases within my experience it has stopped. It would be doing a rational and intelligent act to relieve the patient from a source of irritation which might affect the nutrition of the lens unfavorably. The arrest of the complaint might not follow, but the surgeon has made no mistake if he performs his work well, and he has a reasonable expectation that the pathological process may be arrested.

The distant effects of esophoria include a vast number of disturbances, localized or more general. It is unnecessary to speak of these in detail. Prominent among them are vertigo, nausea, insomnia, headache, and backache. Many of these distant effects are discussed at length in my work on "Functional Nervous Diseases."

A large class of people who from year to year are supposed to suffer from "malaria," "biliousness," "nervous prostration," "dyspepsia," and similar neurasthenic conditions are simply paying the penalty of uncorrected esophoria. The effect of this and other forms of heterophoria are frequently seen in their influence upon the physical functions. Chronic constipation, disurea, and dysmenorrhœa are not infrequent results of the reflex irritation from heterophoria.

Treatment of Esophoria.

While recognizing esophoria as an important anomaly, there may reasonably be a diversity of view respecting the manner in which it is to be treated and the extent to which treatment should be carried.

In the first place it may be held that in case of asthenopia or of more general nervous disturbance from esophoria, treatment directed to the improvement of the general tone of the patient by means, of tonics, rest or change, by the local stimulation by electricity, or other familiar means, the nervous manifestations may disappear. To a certain extent this may be true; but what then disappears is not the disadvantageous condition but the temporary results.

The defect remains to renew its unfavorable influence whenever, as the result of a lowering of nervous vigor through prolonged fatigue or anxiety, or through sudden shock or exposure to unfavorable influences, there remains too little nervous energy to accomplish the ordinary requirements of the individual and to correct the defective muscular tendency. It follows that the relief by the methods named can only be temporary and is by no means radical.

But it may also be questioned whether esophoria of slight degree should be subject to treatment.

I have already pointed out the fact that the reactions from these muscular anomalies are not in proportion to their extent. A condition of esophoria of 1° or 2° may induce a train of nervous symptoms of great importance, and which in spite of any treatment short of relief to the defect itself may continue during many years. I am convinced that any deviating tendency in this direction is a physical disadvantage and should be removed.

But is it proper to interfere with such a condition on purely theoretical grounds, although the subject of the defect may not experience any conscious discomfort from it? At present it is a question to be settled by the individual judgment of those most interested. We should, however, bear in mind the fact that esophoria is a condition which demands constant correction by the person subject to it. This correction demands an expenditure of nervous energy which would not, in the absence of esophoria, other things being equal, be required. In other words, esophoria causes a waste of nervous power. When we recall the continuous nature of this waste and the amount of force at times required to regulate the action of the eye muscles, it will hardly appear extravagant if we assume that even should the subject of esophoria, by virtue of an abundant supply of nervous energy or as the result of favoring circumstances, suffer no conscious annoyance, he is nevertheless deprived of a certain amount of nervous ability which he might otherwise possess, and however capable such a one may be, his powers are still less efficacious than they might be in the absence of an enervating cause. This is a practical fact already demonstrated in an abundant number of cases.

By only two methods can we hope to relieve the tension and perplexity of esophoria. They are by the use of prisms and by tenotomy. I have elsewhere expressed my views respecting the value of prisms in the treatment of heterophoria. They are invaluable as aids in determining the condition of the ocular muscles, not only to be used in the consulting room, but to be worn temporarily by the patient. It is my custom to keep on hand a large number of spectacle frames of uniform size, and a quantity of plain prism glasses of 1°, 2°, and 3°, which can be, without loss of time, slipped into the frames. With these I am able in a moment to arrange temporary prisms for a patient, who may be required to wear them for a few days or a few weeks as the case may be, and such changes in strength of prism can be readily made as circumstances may require. In this way latent heterophoria may become manifest. When no longer needed the glasses are returned and may be used for another. After all that can be done by the wearing of prisms and by gymnastic training by prisms in the hands of the surgeon, there remains *the most effectual and satisfactory treatment, graduated tenotomy.*

It is a matter of the greatest importance to determine precisely under what conditions tenotomy is permissible or advisable and to what extent it may be carried.

For the purpose of greater clearness I will divide the cases into two classes:

1. Simple cases in which the indications are not contradictory.

2. Complicated cases in which the evidences are inconsistent, or in which evidences in the same direction are manifestly disproportionate.

Of the first class we may meet with a variety of conditions.

a. There may by the vertical prism be found no manifest esophoria, nor is hyperphoria shown by the horizontal prism, but *the abduction power is less than the standard.* If, after training the abducting muscles by requiring them to overcome gradually increasing prisms a few minutes at a time for several days, the abducting power remains too low, a weak prism may be worn for a few days with its base out. If even then there is no manifest esophoria and the abducting power is the same or less, and if there is no exophoria in accommodation, an operation is undoubtedly permissible.

b. Less difficult is it to decide if with the restrictions of abduction there is manifest esophoria, provided that the limitation of abduction and the degree of esophoria are proportioned. Should the restriction of abduction be only 1° or 2° while the manifest esophoria should amount to a considerable greater number of degrees, there would remain a doubt whether a complication does not exist, and operation would only be warranted after repeated investigations.

The second class may present far greater difficulties. Here we may have:

a. Restricted abduction with exophoria as shown by the vertical prism.

b. Restricted abduction with or without exophoria but with exophoria in accommodation.

c. Full or excessive power of abduction with esophoria.

All these conditions are liable to be the result of a complicating tension, most frequently of hyperphoria, and whether manifest or latent great caution should be observed before operating, to determine the presence and nature of the complicating element. Should hyperphoria be found, it should always receive attention first.

After the correction of hyperphoria the case may be greatly simplified.

Should hyperphoria be found in a case in which the indications of esophoria are uniform, we should first correct the hyperphoria unless esophoria is of so pronounced a degree as to render it possible that the hyperphoric tendency is a result of the tension of lateral muscles. In such cases an operation for the partial correction of esophoria may be first made.

Very marked and salutary results often follow a tenotomy in case of esophoria of 1° or 2° or in case of abduction of only 5° or 6°. For cases illustrating this the reader is referred to some of my previous works.[1]

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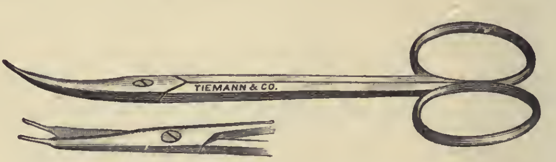
[1] See especially "Functional Nervous Diseases." D. Appleton & Co., 1887.

The method of operating in heterophoria has been described in the former paper.[1] Since writing that paper the method has been still further modified, and I shall here only refer to the modified steps in the operation.

In making the incision through the conjunctiva the smallest possible opening is made, precisely over the centre of the insertion of the tendon. The opening should be less than ½ millimetre in extent. Then the blades of the scissors are introduced with greatest care one on the scleral and the other on the conjunctival side of the tendon, when they are insinuated toward the border, then pressed strongly against the insertion of the tendon.

In order to permit the blades to be introduced in this small wound and to be carried properly into position for cutting the tendon, they have been modified in an important manner. As now made the blades are quite thick and strong until within about one third of an inch from the extremity, when they become suddenly very slender, the two united being less than the size of No. 1 Bowman's probe. The points, although so extremely delicate, are perfectly strong and "walk and talk" together in the most perfect manner. There is no catching or failure to cut under any circumstances.



Subconjunctival Tenotomy Scissors.

In operating for esophoria a certain allowance is to be made for the contraction which occurs in the process of healing.

I have found it advisable to allow not more than 1° or 2 exophoria immediately after the operation, with abduction of 11° or at most of 12°. If we allow a greater degree of exophoria or of abduction, we are open to risk of permanent exophoria. Exophoria of 1° or 2° on the day following the operation is liable to progressive increase, and should the abduction remain in excess with exophoria 1° or more on the next day after the operation, the excess should be corrected. An exophoria 1° or 2°, with abduction of 11° or 12° at the time of operation, very rarely, if ever, shows an over-correction after the the first few hours. On the following day after such an operation, we should hope for abduction of 8° with no esophoria.

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[1] Archives of Ophthalmology, June, 1887.

Should it be required to reduce the extent of the operation, it can be accomplished in the following manner: A delicate Tyrell's hook is introduced beneath the conjunctiva and the divided extremity of the tendon. The hook is then turned with its point forward and pressed against the central part of the tendon when traction is made. The extreme cut border of the tendon is drawn into the small opening of the conjunctiva when a needle carrying a No. 000000 silk thread is passed as near to the edge as possible. It is then passed into the sub-conjunctival tissue at the corneal side of the wound and outward, including the conjunctiva to the extent of less than one millimetre. The thread is tied so as to graduate the tension, bringing the tendon forward sufficiently to guard against exophoria while preserving the required relaxation.

This procedure, when required, should be made with the finest of thread and with the most extreme delicacy of manipulation.

A CONTRIBUTION TO THE PATHOGENESIS OF SYMPATHETIC OPHTHALMIA; AN EXPERIMENTAL STUDY.

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FORTY years ago William Mackenzie summed up his conception of sympathetic ophthalmia in the following words[1]: "I think the chief medium through which sympathetic ophthalmitis is excited is the union of the optic nerves."

This theory found most general acceptance among ophthalmologists till the appearance of Heinrich Müller's investigations fifteen years later. Müller[2] endeavored to find the channel of communication in the ciliary nerves. His conclusions were drawn from the anatomical examination of three eyes, which had been enucleated through fear of sympathetic disease in the fellow eyes. While conceding the possibility of inflammatory transmission along the optic nerves, "the irido-choroiditis of the first eye," he says, "has progressed so far that advanced atrophy of the optic nerve is present. The nerve is nothing more than a fibrous cord incapable longer of conducting an irritation, or indeed any other process, so that simply cutting through the optic nerve will not lessen the chances of sympathetic trouble. The ciliary nerves, on the other hand, do not easily atrophy. The majority of eye diseases attack the anterior half of the eye, and consequently the ciliary nerves from their position would be more exposed to irritation. And when the inflammation of the second eye makes its appearance under the garb of irido-choroiditis, as it frequently does, it is far more logical for us to assume that the inflammation was brought about through the ciliary nerves than through the optic nerve. It is not improbable, that the ciliary nerves exercise some direct influence upon the nutrition of the retina and optic nerve."

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[1] Mackenzie: "Diseases of the Eye," 4th edition, p. 597, 1885.

[2] *v. Graefe's Archiv für Ophthalmologie*, iv., S. 367–370.

The fact (if it be a fact) that changes in the structure of the ciliary nerves are rarely seen, I look upon as one of the strong points in favor of the ciliary-nerve theory, though many of the opponents of this theory think differently. They regard the lack of pathological changes in the ciliary nerves as proof positive of their non-participation in the inflammation, having the idea that the inflammation travels along the ciliary nerves from one eye to the other, producing structural changes throughout its course. But this is hardly possible, certainly not probable. We are only at liberty to assume that the inflammation in the injured eye calls forth a functional irritation of the sensitive ciliary nerve fibres, and this influence finds its way through reflex action to the fellow eye. Pathological changes in the ciliary nerves would interfere with the propagation of such an irritation or influence—their soundness then speaks for and not against the theory. It should not be lost sight of that the ciliary nerves of one eye transmit influences or conditions to the fellow eye through reflex action, and not, as it is possible in the case of the optic nerves, through direct continuity.

The ciliary-nerve theory found a most ardent supporter in v. Graefe, and I might say in the majority of ophthalmologists up to within twenty years ago.

The subject of sympathetic eye troubles was ably discussed by Mauthner in his well-known monograph, "Sympathetic Diseases of the Eye," which appeared in 1879.

In speaking of the possibility of transmission through the blood-vessels, he thinks that the inflammatory process, starting in the choroid of one eye, might be carried over through the choroidal vessels to the ophthalmic artery;

from this point to the internal carotid, and from thence to the circle of Willis. The inflammation then passes along the anterior arch of this circle into the opposite ophthalmic artery, and so to the choroidal region of the second eye. He seems to think though that this is the least tenable of the theories, and consequently lays very little stress upon it. In discussing the optic- and ciliary-nerve theories, his arguments are characterized rather more by diplomacy than by a pronounced individual opinion, for he commits himself to neither of the two. "We have, on the whole," says he, "no right at all to ask whether the sympathetic affection is transmitted along the optic nerves or along the ciliary nerves; nor can we ask whether the transmission takes place along one path more frequently than along the other, for the transmission may be affected in both ways."

The subject was most exhaustively treated from an historical standpoint, but, from the unsettled tone of the work, the Vienna professor leaves his readers, barring a better insight into its history, with as vague an idea as possible of the pathogenesis of sympathetic ophthalmia. Not long after this the old Mackenzie theory was revived by Horner[1] and Knies,[2] and, while convincing some, it had probably quite as healthy an effect in stimulating investigation in this probably the darkest field of eye pathology. The revival of this theory was the result of observation of a case of iritis serosa in a girl nineteen years old. In the left eye there were deposits about the size of pins'-heads on the membrane of Descemet. Nothing of the fundus could be seen with the ophthalmoscope. She counted fingers at a distance of six feet. In the right eye there were slight deposits in the lower half of the cornea about Descemet's membrane. The corpus vitreum was clear. The papilla was markedly red and somewhat foggy. There were no synechiæ on either side. The patient was seized with violent bronchitis, and died soon after from gangrene of the lungs. From sections made the following was noted. The entire iris was immensely infiltrated with round cells, so also the ciliary body and the choroid as far as the optic nerve. The latter showed evident neuritis and cell infiltration, which continued on into the orbit and as far as the chiasm. At this point the pial sheath of the nerve was markedly infiltrated.

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[1] *Correspondenzblatt für Schweizer Aerzte*, ix., Jahrg. 9, No. 21.
[2] *Archiv für Augen- u. Ohrenheilk.*, ix., 1.

This condition was present in both eyes, and, in consequence, the idea suggested itself that, between the two eyes affected alike, a channel of communication through the medium of the optic nerve might exist. And particularly as sympathetic eye inflammation most frequently makes its appearance under the garb of iritis serosa and premonitory papillitis, Knies concluded that the inflammation had travelled from the originally injured eye up its optic nerve to the chiasm, across the latter to the other optic nerve, and from there down to the fellow eye. Horner and Knies thought that they had found still further foundation for their theory when, on injecting a colored fluid into the subarachnoid space of one nerve, it was found to have forced its way through the chiasm into the other nerve sheath.

"The pathologico-anatomical fact and the experiments will at least justify us," says Horner, "in explaining the transmission of the sympathetic process as having occurred through the lymph spaces, and we ought now to abandon the uncertain field of reflexes, vaso-motor disturbances, and neuropathic inflammations."

In 1881 the subject was given still further impetus by the researches of Snellen, Berlin, and Leber.

These three advanced the opinion that the inflammation was of parasitic origin, and hence the appearance of the disease in the second eye must rest upon an infectious basis. They all agreed as to the nature of the ophthalmia, though they did not entertain the same opinion as regards the mode of transmission. Snellen[1] held that it was a specific inflammation, metastatic in nature, where the organisms were peculiarly adapted to the choroidal tissue, and were transmitted through the lymph spaces of the optic nerve, and furthermore, he says, "if this theory of infection is the true one, the only path for the transmission of the organisms is the optic nerve."

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[1] Transactions of the International Medical Congress, London, 1881.

Berlin[1] contended that a portion of the inflammatory products of the first diseased eye was taken up into the general circulation. These products can remain anywhere stationary in the organism without further development, simply because they do not find the conditions suitable for their nutrition. If, however, they get into the capillary region of the uveal tract of the other eye, they there find circumstances analogous to their mother soil, and develop and give rise to inflammation. Leber[2] said that typical inflammations of the coats of the eye are promoted in their development chiefly through the blood-vessels, it making no difference whether the cause of the inflammation was of septic, rheumatic, or tuberculous origin.

Such an assumption, says he, is quite as admissible for sympathetic ophthalmia.

Berlin's hypothesis that the inflammation is a specific metastatic one, and transmitted through the blood-vessels, opens up the possibility of inflammatory appearances in other parts of the body. But this is never the case. The other eye alone becomes involved. Such an hypothesis, then, would only be tenable when we suppose that the nutrition and circulation in the eye differ from those of the rest of the body, that the eye possesses unique conditions for the growth of lower organisms, and that these organisms, in consequence, can attain their growth in the second eye, and nowhere else in the body. We cannot assume this peculiarity for the circulation in the eye in contradistinction to that of the rest of the body. The mere fact that the other eye alone is attacked, leads us to believe that the cause must be a local one. By far the greater number of sympathetic eye troubles are caused by the entrance of foreign bodies. Clinical experience shows us every day that wounds resulting from infectious foreign bodies cause the most violent inflammations, and, on the contrary, wounds caused by aseptic matter, result in comparatively little disturbance.

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[1] *Vollkmann's Samml. klin. Vortr.*, No. 186, 1880. *v. Graefe's Archiv für Ophth.*, xxvii., S. 327.

[2] *Ibid.*, vol. xxvii.

Not long ago I took occasion to perform some experiments on dogs for the purpose of establishing this fact. After sterilizing a cataract knife I made an incision at the upper border of the cornea about half an inch below its junction with the sclera. I passed the knife into the iris and cut upward entirely through the corneo-scleral junction as far as the ciliary region, and in several instances into the latter. The cornea healed up promptly; so also the iris, the healing process in the latter being exactly similar to that after a successfully performed iridectomy. The media always remained clear, and not a symptom of cyclitis followed the operation. Naturally for thirty-six hours after the experiment there was some slight photophobia and lachrymation, but these soon passed away. Leber[1] has shown very conclusively that aseptic foreign bodies may remain in the eye indefinitely without giving rise to inflammatory symptoms. Against the ciliary-nerve theory, says Leber, there remains unexplained the fact that a fixed time, six or eight weeks, passes between the inflammation of the first and second eye, and this is just the time required for the transmission of the inflammation along the optic nerve. Another fact against the ciliary-nerve theory. How can we explain the occurrence of sympathetic troble after the enucleation of the injured eye? If we attribute the sympathetic inflammation to the presence of the injured eye acting as an irritant to the ciliary nerves, should we not suppose that after the enucleation of that injured eye, all danger of subsequent trouble in the second eye was removed immediately and for all time? As regards the outbreak of the disease years afterward,[2] Leber attributes it to a subsequent attack of the old process, or possibly to a fresh infection of the originally inflamed eye. He thinks that too much stress has been laid upon the sensitiveness to touch in the ciliary region as indicating excessive ciliary irritation, regarding this sensitiveness as due simply to the inflamed condition of the whole eye. This is a most reasonable supposition—for almost any inflamed organ or part would be abnormally sensitive to pressure, and why not the ciliary region? We undoubtedly have sympathetic ophthalmia without increased sensitiveness in the ciliary region. Another strong point against the ciliary-nerve theory seems to me the condition we have in glaucoma. In this disease, as is well known, irritation of the ciliary nerves is of so violent a type, that its reflex influence is seen not only in the most excruciating facial neuralgia, but even in parts as remote as the stomach we have functional disturbance manifesting itself in nausea and vomiting. And yet no similar condition of affairs as a result of sympathy is seen in the other eye.

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[1] *Von Graefe's Archiv für Ophthalmologie*, xxx., 1.

[2] "v. Graefe's Archiv für Ophthalmologie," xxvii., 1., S 333.

Wounds in the ciliary region are thought to peculiarly predispose to sympathetic ophthalmia. I thought in connection with this latter idea that I would make some experiments simply to observe the result of wounds inflicted in the ciliary region. My experiments were made on dogs. In every case the instruments were sterilized and introduced through the corneo-scleral junction. The wound was extended from this point up through the ciliary region. I purposely produced a prolapse of the iris into the wound, inasmuch as this kind of wound—eingeklemmte Wunde—is thought to be by some a most favorable condition for the development of sympathetic trouble. In none of the cases did any excessive inflammatory reaction follow. Hyperæmia of the iris,—but no adhesions—photophobia, lachrymation, and some slight injection in the vicinity of the wound were the only results. Two weeks afterward, on examination with the ophthalmoscope, I found the media perfectly clear, and the iris had healed in the corneo-scleral wound, no sensitiveness to light or to touch. The fundus was in every respect normal. The dogs were kept under observation for four or five weeks, and at different times I examined them, but never found any further pathological change. This fact appears undoubtedly significant, for it at least shows that injuries to the ciliary region are not, in themselves, sufficient to produce a sympathetic disturbance, something else is necessary, a something modifying the character of the wound itself.

Of all the contributions to the pathology of this subject, the work of Prof. Deutschmann, has probably attracted the most widespread attention; and his results have been regarded by many ophthalmologists as settling the question beyond a doubt.[1] His earliest experiment was made with the spores of the aspergillus fumigatus, and consisted in making repeated injections of a suspension of these organisms into the corpus vitreum of a rabbit. Choroido-iritis followed the first injection, and at the end of four weeks, or a few days after the fourth injection, he discovers choroido-iritis and opacities in the vitreous of the fellow eye. The animal is killed, and the microscopic examination confirms in every respect the diagnosis. Evidences of an inflammatory process are seen throughout the inoculated eye. Neuritis interstitialis extending on up to the chiasm, with an involvement of the latter, is observed, the process passing on down to the other eye by way of its optic nerve. The iris and ciliary region of the sympathetically affected eye were not examined; the posterior half of the eyeball showed abundant signs of inflammation in round cell infiltration. He concluded, therefore, that a sympathetic inflammation may be produced in one eye by the introduction of infectious matter into the other eye, and that the track of this inflammation is along the optic nerve and its sheaths. Being convinced, though, that the inflammation produced by the aspergillus fumigatus was the result of chemical irritation, and knowing that such an irritation is rarely, if ever, concerned in the production of sympathetic ophthalmia in human beings, he resorted to the pus[2] organism for the inoculating material. He injects then two or three drops of a suspension of staphylococcus pyogenes aureus into the corpus vitreum of one eye. On the following day posterior synechiæ and corpus vitreum opacities are observed. On the second day the animal shows signs of meningitis, no new feature, as far as could be seen, showing itself in the inoculated eye. The papilla of the fellow eye, however, was very red and injected, the vessels enlarged and tortuous. The animal dies on the third day.

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[1] *v. Græfe's Archiv für Ophthalmologie*, xxviii., 2; xxix., 4.

[2] *v. Græfe's Archiv für. Ophthalmologie*, xxx., 4.

The microscopic examination reveals purulent infiltration of the inoculated eye, this infiltration extending on up toward the chiasm with diminishing intensity, to increase in intensity, however, in its passage from the chiasm down the second optic nerve. In the infected eye both optic nerves, the chiasm, the pia mater of the base of the brain, and in the papilla of the fellow eye the presence of micro-organisms is proven, viz.: the staphylococcus pyogenes aureus. To avoid the complication of meningitis, he makes a very dilute suspension of the micrococci, and inoculates five rabbits. Only one of the animals gives a negative result; negative in so far that after remaining alive for several weeks, no change was observed in the fellow eye. The other four animals die at periods ranging from five or six days to two or three weeks. The participation of the second eye shows itself in papillitis, cloudiness of the retina, narrow pupil, and sluggish iris. There is no symptom of meningitis, but the animals lose their appetite and die after a few days. Cultures from the blood of the animals reveal the staphylococcus aureus. The cause of death, then, is a general infection. As regards the microscopic examination of the eyes and optic nerves. The fate of the first eye is generally iridochoroiditis, followed by phthisis bulbi. Round cell infiltration with micrococci were to be found in both optic nerves, chiasm, and in the posterior half of the second eye,—a typical sympathetic ophthalmia, he concludes, in all but one feature, namely, in the non-participation of the iris and ciliary region of the fellow eye. And the reason the iritis is absent, says he, is because the animals die before the organisms have time to reach the anterior portion of the eye. If, then, he can shorten the path which the organisms take in their journey to the anterior portion of the uveal tract of the second eye, he will be able to produce an iritis before the death of the animal, and will have proven that had the animal lived long enough, a sympathetic iritis would have developed itself. For this purpose he makes the following experiment: After a tenotomy of the superior rectus muscle, he passes in a delicate blunt instrument, and pulls forward the optic nerve, which he severs as close as possible to the optic foramen. Into the cut end he injects a very small quantity of a suspension of staphylococcus aureus, and ties up the cut end to prevent the escape of the fluid into the orbit, and then replaces the parts. It is sufficient to say that on the third day he establishes the existence of iritis with hypopyon, and the microscopic examination shows purulent infiltration of the iris and ciliary region.

In eight or ten cases where one eye had been enucleated on account of imminent danger of sympathetic ophthalmia in the fellow eye, Prof. Deutschmann detects the presence of the staphylococcus aureus and albus. He concludes then that sympathetic ophthalmia in man is most probably an inflammation propagated through the optic nerve and that the "Entzündungserreger" are micro-organisms.

Such striking results would seem to promise an easy confirmation, and with this idea I determined to repeat the experiments of Deutschmann. My earlier experiments were made upon dogs. I chose dogs as I supposed they would be less likely to succumb to the effects of a general infection and in consequence they would enable me to follow out more accurately the theory of Deutschmann. My technique was the same as that employed by Deutschmann—and consisted in injecting a suspension of staphylococcus aureus into the corpus vitreum. The instruments employed were always thoroughly sterilized previous to the operation. About two minims of the inoculating fluid were injected. After fixing the ball of the eye with a pair of forceps, I pulled the eye forward and passed in a hypodermic needle half an inch posterior to the ciliary region. I may add that the organisms were obtained from a furuncle and were identical with the staphylococcus aureus of Rosenbach.

I have selected for this paper the clinical history of those cases killed at periods ranging from three weeks to two months, as covering the most probable time in which a sympathetic trouble would develop.

CASE 1.—June 16th. Inoculated a small black bitch in the right eye, injecting two minims of the suspension in sterilized water. A slight clouding of the vitreous was observed a few hours later. The morning after the operation the media had become so cloudy that it was impossible to get a view of the fundus. Iridocyclitis ensued, followed by panophthalmitis and rupture of the eyeball, the latter occurring on the third day after inoculation. Healing of the ruptured eye was very prompt. I examined the other eye with the ophthalmoscope every day, but never detected any thing abnormal. The animal was killed on July 9th. The eyes were carefully dissected out with their optic nerves and chiasm. Marked phthisis bulbi of the inoculated eye was observed, but no atrophy of the nerve, indeed there was no difference in the macroscopic appearance of the two nerves. Microscopic examination showed the bulb of the inoculated eye densely infiltrated. Everywhere throughout the uveal tract, retina, and vitreous lymph cells were abundant. The papilla was very much swollen and was densely infiltrated with round cells. This cell infiltration extended on up the nerve involving not only the trunk of the nerve itself, but also its sheaths and the intervaginal space. This infiltration rather decreased in intensity as it neared the chiasm, and at this point it was hardly possible to say with certainty whether the physiological number of nuclei had been overstepped. There was certainly nothing that would be regarded as pathological in that part of the chiasm continuous with nerve of the healthy eye. Examination of the second eye and its nerve revealed a perfectly normal condition of the parts. There was no cell infiltration of the orbital tissue adjacent to the inoculated eye, nor of any portion of the brain touching upon the optic nerves and commissure. The most careful examination failed to reveal the undoubted presence of organisms.

CASE 2.—June 29th. Inoculated in the usual way a white poodle. Clouding of the vitreous in the course of a few hours. Next day the eye was enormously swollen, showing evident panophthalmitis. The eyeball ruptured on the fourth day. The dog was allowed to live till the middle of November, when it was killed. At no time did the other eye show any signs of sympathy. Microscopic examination showed the inoculated eye to be infiltrated throughout with round cells. The eye had shrunken so much that the relative position of the coats had been lost. A cheesy mass filled the space once occupied by the vitreous. The papilla was swollen. Marked papillitis and neuritis, the latter extending about one inch from the intraocular end of the nerve. The chiasm, the optic nerve of the second eye, and the latter itself were all perfectly normal. I failed to find any micrococci.

Case 3.—June 27th. Inoculated a brown puppy (about five months old) in the right eye. Irido-cyclitis followed by rapid phthisis bulbi. The eye did not rupture. Twenty-six days after the inoculation, I observed in the left eye a clouding of the cornea. On a close examination by oblique illumination I became convinced that the clouding was not superficial, but, on the contrary, deep-seated ; in other words, that there existed an interstitial keratitis. The surface of the ball of the eye was entirely free from wound, abrasion, nor indeed was any external cause visible. A cause from without would probably have given rise to a superficial inflammation, but here the superior layers of the cornea were intact. Causes extrinsic do not give rise to inflammations of the cornea limited to the parenchyma. The cause here was plainly intrinsic and I naturally supposed that I had before me a typical case of sympathetic ophthalmia, where the organisms after traversing the uveal track had passed over from the iris to the membrane of Descemet and here set up inflammation. In two or three spots on this membrane there were small white deposits.

If, however, the organisms had taken this track, there must be present also an iritis and choroiditis. Owing to the corneal clouding it was impossible to ascertain the condition of the fundus. But the iris was in every respect normal, acting promptly. After keeping the dog under further observation for forty-eight hours and noticing no new feature in the case, he was killed. The microscope showed throughout the inoculated eye dense round-cell infiltration ; neuritis optica extending about half an inch from the papilla, but from this point on up the optic nerve to the chiasm and down the other optic nerve, no pathological change was to be seen. As regards the second eye, and more particularly the choroid, ciliary body, and iris of the same, I found not the faintest trace of an inflammatory process, other than the keratitis, and should say that with the exception of the cornea, the eye was perfectly normal. The keratitis then was a spontaneous process, separate and distinct in its origin from the causes which resulted in the destruction of the other eye. A close examination for micro-organisms failed to reveal the presence of the latter.

Case 4.—July 6th. Inoculated the left eye of a large brown bitch. Soon after clouding of the media, followed by irido-cyclitis and Descemetitis. The inflammation subsided in ten days and left the eye with several thick corneal opacities and anterior synechiæ. Pthisis bulbi followed. The dog was killed September 3d. The microscopic examination revealed evidences of inflammation in every part of the eye. There was also inflammation of the optic nerve, infiltration extending about half an inch from the intraocular end of the nerve. Nothing noteworthy in the nerve was observed beyond this point, nor was there any thing pathological in chiasm, the other optic nerve, or the second eye. I could find no organisms.

Case 5.—July 15th. Inoculated the right eye of a small black bitch. Followed as usual by irido-cyclitis and clouding of the media. On the the third day diffuse clouding of the cornea. Violent keratitis. Perforation of the cornea with prolapse of the iris. Four weeks later all signs of an acute inflammation had subsided, leaving a large corneal opacity, and just at this point the iris had fallen forward into the perforation and healed. The dog was killed September 3d. The microscopic examination revealed extensive round-cell infiltration throughout the inoculated eye. Neuritis optica extending not more than a quarter of an inch from the eyeball. The chiasm with the second eye and its nerve was perfectly normal. No micrococci were to be found.

I have selected the records of the above five cases as they appeared to be fairly typical of this series of experiments extending from the early part of June to the middle of November. The other cases differed in very few particulars from the above, certainly in nothing that could be regarded as throwing any additional light on the subject.

I made fifteen experiments in all. In nine of the cases the eyeball ruptured and the contents were disgorged. The fate of the other six cases was cyclitis, choroido-iritis, ending with phthisis bulbi. The first dog was killed three weeks after inoculation, the second dog four and a half months, the third twenty-six days, and the fourth and fifth cases two months and six weeks respectively. I selected dogs, as I have said, because I thought that, unlike rabbits, they would be less apt to fall victims to a general infection. In this respect the whole aspect of my experiments on dogs resembled more nearly what we see in man, for in only one instance did I observe any thing like a constitutional effect (Case 3). The trouble remained local. All the cases were examined every day with the ophthalmoscope. Never was any thing unusual observed about the second eye. In two cases there was noticed twenty-four hours after inoculation, an enlarged condition of the retinal vessels, associated with a general redness of the papilla. This disappeared at the end of three or four days. It certainly could not have been due to the presence of organisms, for there was not the faintest trace of an inflammatory process in the fundus, and the corpus vitreum was always perfectly clear. It was, I think, a reflex engorgement of the vessels, due, without a doubt, to the violent inflammation going on in the other eye, and there is no reason to be believe that it could ever have developed into a condition similar to that of the first eye.

Further than these two cases I observed nothing in the second eye that would suggest sympathy with the condition of the inoculated eye.

Rupture of the eyeball, and the consequent disgorgement of its contents, is thought to exclude the possibility of sympathetic ophthalmia. No. 1 was the only case where cell infiltration was present in the neighborhood of the chiasm, and yet here the inoculated eye ruptured on the third day. I made a most thorough examination of the intercranial end of the optic nerve and of the chiasm in this case, but failed to find any organisms. The existing inflammation must then have spread from the point of infection by contiguity or continuity, and if produced by the micro-organisms, these must have disappeared by the date of the examination.

In one point my experiments differ from those of Prof. Deutschmann, namely, in the fact that mine were made on dogs. Thinking that this difference might impair the value of my work as a control of that of Prof. Deutschmann, I determined to repeat his experiments on rabbits.

Two months ago a man came to the eye clinic with the history of a foreign body in the eye. While working on the railroad, a week before, a piece of iron flew into the right eye. When seen at the clinic, the diagnosis of panophthalmitis was easily made, and enucleation was performed. The foreign body was a piece of steel, and was found imbedded in the retina. The whole eye was filled with pus. I obtained a few drops, and brought them in a test tube to the laboratory, and then made plate cultures after Koch's method. I succeeded in isolating the staphylococcus aureus, and obtained a pure culture identical in every respect with the staphylococcus aureus of Rosenbach.

I have selected for this paper the following clinical histories of experiments on rabbits:

CASE 1.—*April* 11*th.* Injected four minims of a solution of staphylococcus aureus into the corpus vitreum of the right eye.

April 13*th.*—Clouding of vitreous.

April 18*th.*—White deposits in the pupillary space. Posterior synechiæ.

April 23*d.*—Blood in anterior chamber. Great injection of conjunctiva and iris. Left eye normal.

April 30*th.*—All the appearances of general inflammation of the infected eye.

May 10*th.*—The eyeball immensely swollen. Panophthalmitis. The left eye remaining throughout perfectly normal. Not the slightest evidence of sympathy. There was no change in the condition up to the 17th of May, when it was killed.

Microscopic examination.—Infected eye filled with a cheesy mass. Infiltration of corpus vitreum with leucocytes. Round-cell infiltration throughout iris and ciliary body. Choroiditis and retinitis. Papilla tremendously infiltrated. Here, there was undoubted neuritis. The neuritis extended about half an inch from the eyeball, and, from this point on, there was no appearance of cell infiltration. The chiasm and the optic nerve of the fellow eye were perfectly normal. No bacteria could be found.

CASE 2. *April* 11*th.*—White rabbit with gray ears. Inoculated in right eye.

April 11*th*—Cloudings in corpus vitreum.

April 16*th.*—White deposits in pupillary space. Iritis. Left eye normal in every respect.

May 3*d.*—No change.

The animal was examined every day till the 19th of May, when it was killed. At date of death the pupil was entirely closed with a white deposit and the iris bulged forward, almost obliterating the anterior chamber. The fellow eye remained throughout normal.

Microscopic examination: Inflammation of all the coats of the eye, and enormous infiltration of the corpus vitreum with leucocytes. Detachment of the retina and thickening and infiltration of the choroid with round cells. Papilla swollen and densely infiltrated with round cells. Neuritis extending about a quarter of an inch from the eyeball. From this point on there was nothing abnormal in the appearance of the nerve. The chiasm was normal; so, also, the optic nerve of the fellow eye. I could find no organisms.

CASE 3. *April 11th.*—Black-and-white rabbit. Inoculated right eye.

April 13th.—Choroido-iritis. Floating opacities in the vitreous.

April 15th.—Iris very much injected. Posterior synechiæ. White deposit in the pupil. The eye remained the seat of an inflammation, marked by no new feature, till May 21st, when the animal was killed. The fellow eye never showed any signs of sympathy. Microscopically, the infected eye had somewhat shrunken. The corpus vitreum was filled with a cheesy mass. The iris and lens were bound together by synechiæ. The optic nerves were both about the same size.

Microscopic examination: Round-cell infiltration everywhere present. Almost complete disorganization of the choroid and retina. Difficult to make out the relation of the parts. Dense cell infiltration of the optic nerve extending about a quarter of an inch from the eyeball. The rest of the optic nerve, with the chiasm and optic nerve of the opposite side, were normal. A sterilized platinum wire was introduced into the interior of the eyeball after I had burnt a way for its passage through the cornea with a hot knife, and inoculations were made upon agar. Esmarch's method was employed, and numerous colonies of micro-organisms were to be seen the third day afterward. They were, however, not the organisms with which I had made the inoculation.

CASE 4. *April 11th.*—Inoculated a gray rabbit in right eye.

April 13th.—Choroiditis. Opacities in the vitreous. The pupil appeared to get smaller every day, till April 26th, when it was not larger than a pin's head.

April 26th.—Iris bulging forward into the anterior chamber. Great injection of the iris. The left eye remaining perfectly normal.

May 3d.—Blood-red appearance of iris, and the latter appears as though thrown into folds.

May 7th.—No change.

No new feature developed itself from this time till June 7th, when it was killed.

Microscopic examination: Eyeball filled with a cheesy mass. Detachment of retina. Infiltration of choroid, retina, and ciliary region with round cells. Purulent infiltration of the vitreous. Papillitis. Neuritis immediately adjoining the eyeball. No organisms.

CASE 5. *May 17th.*—Inoculated a white rabbit in left eye.

May 21st.—Eye very much injected, and impossible to see the fundus. Dense clouding of the corpus vitreum. The right eye normal. This case was examined every day till May 31st, when it was killed. No new feature showed itself in either eye. The infected eye was cut open with a hot knife, and a sterilized platinum wire was passed in. Inoculations were upon agar, and Esmarch tubes were made. They were placed in a breeding oven, and twenty-four hours later beautiful colonies of staphylococcus aureus showed themselves. I made a stab culture and obtained a pure and typical growth in every point identical with the organism with which I had inoculated the eye.

The optic nerve and chiasm were entirely free from organisms.

To sum up then my experiments on rabbits. The first rabbit died forty-eight hours after inoculation, the second rabbit ten days after inoculation. The latter gave evidences of brain trouble before death in spasmodic movements of the neck and inability to move without falling forward. The autopsy revealed a very hyperæmic condition of the brain. The first rabbit died with all the symptoms of a general infection. Both animals were very young, hardly more than a month old, much too young for such experiments. Five rabbits inoculated on March 28th met with violent death on April 11th, killed by dogs. Careful examination every day with the ophthalmoscope and a microscopic examination of sections from the optic nerves, chiasms, and eyes of these five animals never revealed a feature differing from what was seen in the five cases just reported in full. The third series of experiments consisted in the inoculation of eight rabbits. These were killed at periods ranging from four weeks to two months; one exception, Case 5, which was killed in fourteen days. An ophthalmoscopic examination was made every day for the first three weeks; and afterward never were more than three days allowed to pass without such examination. Never did the fellow eye show the slightest symptom of sympathy. The fundus remained unchanged, perfectly normal; not even did the blood-vessels take part by increase of size, in other words, no hyperæmia. Every one of the eyes suffered with irido-cyclitis in its most typical form.

There is one point in connection with experiments in general on dogs and rabbits upon which I would lay particular stress. There is great difficulty in recognizing a true inflammation of the optic nerves and the chiasm, and indeed of the choroid and retina too, unless you have normal sections of these parts right at hand with which to compare your supposed pathological conditions. In the first five experiments on dogs I was perfectly convinced that I had a neuritis extending from the infected eye around to the fellow eye by way of the chiasm. I submitted the sections to skilled microscopists, and they agreed with me. The suggestion was made though that I kill a dog and study the normal condition of the parts.

I did this, and to my surprise found that the normal optic nerve of the dog was most rich in nuclei, nuclei which gave to the nerve the appearance of dense round-cell infiltration. It is a fact worthy of note that the chief distinguishing feature of inflammation of a nerve at this stage is the increase in the nuclear elements, and upon this point we must mainly rely in making a diagnosis of neuritis. Changes in the nervous bundles themselves are not readily demonstrable features of a neuritis of three weeks' duration.

The fact then that we must regard the number of nuclei as in great measure deciding the existence of inflammation, the fact that the physiological number of these nuclei from their abundance can easily deceive us and lead us to conclude that we are looking upon a pathological number, that we have before us genuine leucocytes, all these facts, I say, point to the necessity of comparing what is known to be a normal condition with the section under observation. And by this I mean to say, that longitudinal and cross-sections of the ball, optic nerve, and chiasm of the eye to be examined must be compared with corresponding sections in what is known to be the normal state. In the case of the optic nerve and chiasm, sections must be compared from as near as possible corresponding portions of the nerves, as I have observed a difference in the number of nuclear elements in portions of the nerve. The nuclei are rather fewer and more scattered in the neighborhood of the chiasm. They are generally most abundant at the intra-ocular end of the nerve. It will be remembered that in several of Professor Deutschmann's cases the cell infiltration decreased in intensity as it neared the chiasm, and increased in intensity on the way from the chiasm down to the other eye. This is exactly what we have in the physiological condition. The nuclei are, as I have said, abundant at the intra-ocular end of the nerve, decreasing in number toward the chiasm, comparatively scattered and few in the chiasm itself, and increasing in number from the chiasm toward the fellow eye. I do not mean to be understood as asserting that Professor Deutschmann has really mistaken the normal condition of the nerve for a neuritis descendens and ascendens. But such a mistake could readily be made. He performed five experiments. My experiments number 15 on dogs and 15 on rabbits, and in the main points my results contradict his completely. Dr. Gifford's experiments of inoculations with the pus cocci number seventeen, and his results coincide with mine. What I said of the normal optic nerve of the dog is equally applicable to the normal optic nerve of the rabbit. This also is rich in nuclei.

In short, unless the precautions which I have suggested be taken in experiments of this nature upon dogs and rabbits, a reasonable doubt must be cast upon the accuracy of a diagnosis of existing inflammation.

As regards the condition of the fellow eye: In several of his cases Deutschmann notices, with the opthalmoscope, changes in the fundus, papillitis, retinitis, and choroiditis, though the anterior portion of the eye remains healthy. It will be remembered that in his experiments all of his animals die of a general infection. Cultures from the blood show the presence of micro-organisms. That means that there were organisms in the kidneys, heart, and throughout the circulation. We are not surprised when we see a neuro-retinitis or choroiditis or clouding of the whole fundus in a patient who we know has nephritis, or pyæmia. Pernicious anæmia, heart disease, in other words, great disturbances in the circulatory system, are prolific causes of diseases of the fundus. We have here an animal succumbing gradually to the effects of a blood poison, dying with pyæmia. Kidneys loaded with micro-organisms, heart and entire circulation alive with pus cocci. With so violent a provocation, can we regard it as extraordinary that the fundus should be the seat of inflammatory changes, especially when we consider how very liable it is to participate in vital changes in the general system?

In Case 3 (dog) I look upon the keratitis as simply a manifestation of constitutional disturbance brought about by the presence of micro-organisms in the blood. This was the only instance among the dogs, where I observed any evidence of constitutional disturbance, showing that dogs, unlike rabbits, are not liable to give way to a general infection. Furthermore, I regard a general infection as a serious objection to these experiments, not only because the animal dies before the sympathetic inflammation shows itself; but the fact that there is present a constitutional disturbance removes the analogy between the experimental process and the disease as seen in man. Sympathetic ophthalmia in man is from beginning to end a local affection.

I report here three cases which came under my own personal observation, where the injured eye was enucleated for fear of sympathetic ophthalmia. In all three cases the injury was caused by the entrance of a foreign body. I have examined several other eyes for organisms, but always with a negative result, and I do not report them, as there was no history of injury from a penetrating foreign body.

Case 1.—S. M., boy, eleven years old. Six years ago, fell on a piece of glass, a particle of which entered the right eye just above the corneo-scleral border. Choroido-iritis ensued, followed by rapid phthisis bulbi. Six months afterward the left eye took on inflammation, and up to present date (April 28th) has been the seat of periodic inflammation, accompanied with a great deal of pain.

Stat. præsens.—Right eye very much shrunken, and not half the original size ; not sensitive to touch. The left eye presented a broad band of corneal opacity running across the centre of the cornea. The pupil was bound down by posterior synechiæ, and a white deposit in the centre showed that cataract was present, cataract resulting from the frequent deposit of inflammatory products upon the anterior capsule of the lens. Tension was decidedly minus ; light perception good. Inasmuch as the atrophic eye was utterly useless, and was possibly through its presence giving rise to the recurrent attacks of inflammation in the fellow eye, it was enucleated. The whole interior of the eye was filled with a cheesy mass, and the internal coats had undergone complete disorganization. It was impossible to make out the relative position of the parts. Round-cell infiltration was everywhere present, neuritis extending to point of section of the nerve. Cultures from the interior of the eye made into Esmarch tubes failed to show any signs of growth. Half of the eye was put into a tube of gelatine, but nothing grew. The bacteriological examination was made prior to cutting open the eye.

Case 2.—May 25th, 1887.—J. C. Lewis. About six weeks ago while at work, a piece of the hatchet—with which he was driving a nail—flew off and struck him in the left eye. When seen he was suffering great pain. Light perception gone. Eyeball very much injected and sensitive to touch. The pupil was completely closed by posterior synechiæ. The diagnosis was of course irido-cyclitis. The fellow eye had been the seat of shooting pains within the past few days, and was somewhat sensitive to light. The ophthalmoscope revealed a perfectly normal fundus. The pupil responded promptly to light, *not* sensitive to touch and as far as I could see absolutely healthy. The injured eye was enucleated and the piece of iron was found imbedded in the ciliary region. The microscope showed round-cell infiltration throughout the eye, most noticeable in the ciliary region. Papillitis. Sections prepared for bacteriological examination failed to show the presence of micrococci. Cultures from the interior of the eyeball gave no evidence of the presence of bacteria.

Case 3.—H. White, 19 years old. Lost right eye six weeks ago in an explosion. No light perception. Large corneal wound. Prolapse of iris. Pupil very small and closed with a white deposit. Tension minus. Ciliary injection, though the eye was not particularly sensitive to touch. Enucleation. Cultures made. There were, however, no signs of growth in the tubes. Within, the eye had undergone degeneration. No microscopic examination was made.

I may here refer to a case reported by Prof. Hirschberg where the enucleated eye—after the patient had suffered two weeks with a sympathetic inflammation—was examined for organisms by Nordenson in Koch's laboratory. The result of the examination was completely negative. (*Centralblatt für praktische Augenheilkunde*, Januar, 1888, S. 20.) Also to a case of "sympathetic neuroretinitis," reported by S. C. Ayres and Adolf Alt, when not a trace of bacteria was found in spite of the most careful examination. (*American Journal of Ophthalmology*, February, 1887.) In nearly all of the eyes enucleated for fear of sympathetic inflammation, Prof. Deutschmann found micrococci.

In my cases the cultures were made from the eyes almost immediately after enucleation. Every precaution was taken to avoid contamination. In making cultures from the vitreous the cornea was first sterilized with a hot knife. The point of the blade was then passed into the anterior chamber. Through this hole a sterilized platinun wire was passed into the corpus vitreum and twisted about in every direction within the eyeball. The inoculations were upon agar, and Esmarch tubes were made. By this method or the plate mode of culture, one can be certain that one is not dealing with impurities. Any other known method is open to objections. I observed that Prof. Deutschmann never took this precaution, making simply the stab culture. It is quite possible that he inoculated an impurity, at least he can not be perfectly certain that the growth upon the gelatine had its origin within the eye. In the first two of my cases, in addition to the inoculations, the eyes were cut in half with a sterilized knife. A half from each eye was sterilized on the outside with hot knives and put into a gelatine tube. Nothing grew. The other two halves were stained and examined under the microscope with the result already mentioned.

Prof. Deutschmann observes micrococci in the tissues themselves, even in the optic nerve. This I am unable to explain. I can only say that, with the strictest precautions against contamination, I did not observe in any of the clinical cases last reported any appearances in the tissues which could be unmistakably pronounced organisms. In staining for bacteria I employed both Gram's and Weigert's fibrin method, the universal stain of Löffler, the tubercle stain, etc.

Prof. Deutschmann has never given a satisfactory explanation of how the organisms get from one eye to the other. The micro-organisms, says he, work their way forward with a certain impetus, an impetus which comes from their own growth, as well also from their power of spontaneous movement (Eigenbeweglichkeit). So they reach the chiasm and from thence they are carried downward to the other eye by the lymph stream. Now if the micrococci had this power of spontaneous motion we would want no better explanation. But micrococci do not possess this property.[1] "Micrococci and all those kinds of bacteria whose form of growth resembles the micrococci, are always in a state of rest, except such movements as are to be attributed to unavoidable shocks," as for example, mechanical violence to a part.

It may be a matter of surprise that rupture of the eyeball occurred in so many cases in my experiments with dogs, and not a single time with the rabbits. I think this is easily explained. In the case of the dogs the injections were made with a very coarse hypodermic needle, the point of which was somewhat blunted from constant use. In forcing the needle through the tough sclerotic much force was employed, and the eyeball subjected to a good deal of mechanical violence, and, at the point of puncture, there was always more or less of a contused condition of the tissues, ecchymoma, etc. At this point, no doubt, the tissues were infected, the nutrition of the whole eyeball was disturbed by the mechanical violence employed, and this, in conjunction with the presence of pus cocci within, afforded the conditions necessary for a general inflammation. Later on I obtained the finest needle that could be gotten, and I had no further trouble with the injections.

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[1] "Die Mikroorganismen," von C. Flügge, S. 124.

Why did so few of my animals die of general infection? Among other things they were kept in an amply large and well-ventilated apartment, and always had plenty of good food, but mainly because the quantity of cocci injected was very small. A very weak suspension was employed. In injections of pus cocci the intensity of the effect is in direct proportion to the quantity of organisms injected. This peculiarity is not associated with the history of the organism of anthrax, and here let me briefly refer to some experiments made by Dr. Gifford with the anthrax bacillus. His work appeared in these ARCHIVES (vol. xv., pp. 281–295). He takes the view that the organisms leave the first optic nerve with the vessels, and, after passing through the orbit, reach the cranial cavity. They pass from this point into the subvaginal space, and from thence along into the suprachoroidal space of the second eye. It is strange that Dr. Gifford should have used the anthrax bacillus for such experiments. He could not have selected an organism which would have given him results less valuable to the history of the subject. Twenty-five experiments were made, and every one of the animals died of general infection. In only three cases did the rabbits live long enough for the bacilli to reach the second eye. With the exception of the mouse, there is no animal that succumbs more promptly to anthrax than does the rabbit, and if all twenty-five of the cases had lived long enough, the second eye would have been found filled with bacilli, and for all that, no new fact, certainly no valuable one, would have been established. Furthermore, it would have been extraordinary had the organism not been found in the second eye, and that, too, in the suprachoroidal space, as well as everywhere else in the second eye. I examined a number of mice last summer that had been inoculated with anthrax at the *root of the tail.* The animals had died in twenty-four hours after inoculation. I selected at random pieces from different parts of both eyes and optic nerves, and in every specimen countless bacilli were to be seen.

My results then, as far as confirming the theory that sympathetic ophthalmia is propagated along the optic nerves and its sheaths, were entirely negative. As I have already said, the optic nerve of the infected eye at its intraocular end was always infiltrated. A moment's glance was sufficient to tell me that, but any noticeable progress of the inflammation for more than a very short distance from the eye was never observed. This portion of the nerve could hardly have escaped participation. Its proximity alone to such an inflammation would have called forth changes in its own structure. In this connection it is pertinent to call attention to experiments which have been made to determine whether or not inflammation, induced experimentally in a circumscribed part of a nerve, is capable of propagation for a long distance in the nerve trunk. Of these experiments the most exact and trustworthy are those of O. Rosenbach, who injected chemical irritants, such as turpentine, Fowler's solution, etc., into the sciatic and vagus nerves. Rosenbach's experiments were performed under Cohnheim's direction. As he used no especial antiseptic precautions, it is reasonable to believe that micro-organisms were not absent. In opposition to preceding experimenters Rosenbach failed to find that the local inflammation travelled any considerable distance along the nerve from the site of the injection. My own results are in harmony with Rosenbach's conclusions. He says: "The result of the microscopical investigation, in spite of the positive changes which it presents to us, is nevertheless, as regards the propagation of the neuritis, a completely negative one. Only so far as the chemical and mechanical action of the injection reaches is there any change, and beyond this—so far as the methods of investigation can lead us to a conclusion—is every thing intact. (O. Rosenbach: "Experimentelle Untersuchungen über Neuritis." *Archiv. für experimentelle Pathologie und Pharmakologie*, B. viii., S. 231.)

The question then arises, Does infection play a roll in the production of sympathetic inflammation of the eye? Experience in a large eye clinic for the past four years has inclined me to the affirmative side of the question. That the optic nerve, however, is the track of the infection, my experiments have led me to doubt seriously. The experiments of Leber, and mine of the same character, indicate quite conclusively that aseptic wounds of the eyeball, whether of the ciliary region or not, produce little disturbance. More or less violent is the result of septic wounds.

The experiments which I have reported shed no positive light upon the mode of production of sympathetic ophthalmia, for in no instance was this affection a sequel of the operation. It is reasonable to suppose that had the same insults been applied to the human eye, at least in some instances sympathetic ophthalmia would have resulted. This raises the question whether rabbits and dogs are susceptible to sympathetic inflammation of the eye. Upon this point I am unable to bring any positive evidence. I do not feel warranted, on the basis of the negative results of my experiments, in drawing any positive conclusions as to the genesis of sympathetic ophthalmia.

These experiments were undertaken in order to control the results which others had obtained by similar investigations. That the conclusions which had been drawn from these results must be corrected and revised seems to me the justifiable inference to be drawn from the experimental work presented in this paper.

My experiments were made in the Pathological Institute of the Johns Hopkins University. I take this occasion to express my thanks to Prof. Wm. H. Welch, Director of the Institute, for his kindly aid. His advice on every point I have found most useful. And I would also thank Dr. B. Meade Bolton, assistant in bacteriology, for the material assistance which he rendered me in the bacteriological part of my work.

A CASE OF GLAUCOMA IN A MAN TWENTY-TWO YEARS OF AGE.

By Dr. GEO. C. PARDEE, of San Francisco.

THE following notes on a case of glaucoma occurring in a young man of twenty-two years of age may not, on account of the youth of the patient, prove uninteresting.

W. C., aged twenty-two, came to me with the following history: Has never had syphilis; no blindness or eye-trouble in his family, except in the case of his father, who, on removal of the bandages after an operation on both eyes, was found to be totally blind. About two years ago the patient noticed that his right eye was failing him. About one year ago the right eye became totally blind; and about the same time the patient noticed that the left eye was also failing, becoming totally blind about two months ago—ten months after he first noticed the beginning failure. Three months before becoming totally blind he consulted a physician; but on account of poverty, did not have any thing done. He has never had any pain in or about the eyes, or any inflammation in them.

Status præsens.—Both eyes very hard — T + 2; both pupils expanded *ad maximum* and irresponsive to light; right eye seat of a mature cataract; anterior chambers very shallow. Left eye: vitreous slightly cloudy; papilla deeply excavated; arteries small and pulsating readily on pressure; veins tortuous and swollen.

Diagnosis: *Glaucoma chronicum absolutum.*

The patient first noticed the dimness of vision in the right eye about two years ago. It is safe to suppose, therefore, that the disease first attacked the eye at least one year previously, or when the patient was nineteen years of age.

The fact that the patient's father underwent a bilateral operation—the nature of or reason for which the patient does not know—would, perhaps, raise the suspicion that the disease is hereditary; although the fact that none of the rest of the family of his five children have, as yet become affected rather speaks against heredity.

A CONTACT-LENS.

By Dr. A. EUGEN FICK, Privat-Docent in Zurich.

Translated by Dr. Charles H. May, New York.

AMONG the numerous diseases of the cornea, there are many which change its normal form; this results in the production of distorted or even completely blurred retinal images, and accordingly vision suffers. Now there is a group of alterations in the form of the cornea, of which the bad effects upon vision may be removed by the use of glasses; these are cases of regular astigmatism. As is well known, they can be optically corrected with appropriate cylindrical lenses. The matter begins to be more difficult, however, when we deal with the alteration in the form of the cornea known as keratoconus. Attempts have been made to correct the optical error due to keratoconus by hyperbolic[1] and by conical[2] glasses. Even though there were no mathematical objection to this, the fact remains, as Rählmann himself observed, that whatever improvement is obtained in acuteness of vision is lost again, as soon as the eye and the hyperbolic lens are no longer accurately centred; therefore movements of the eye must be suppressed and replaced by movements of the head; it is also a fact, that the practical improvement obtained in acuteness of vision is often very insignificant or even *nil;* this is due, according to Angelucci, to the deviation of the corneal axis from the visual line.

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[1] Rählmann, Gläsercorrection bei Keratoconus. Bericht der ophth. Gesellschaft zu Heidelberg, 1879, und Ueber die Verwendung der hyperbolischen Gläser zur Correction des Keratoconus und des unregelmässigen Astigmatismus. Bericht der Dorpater Universitäts-Augenklinik, 1881–1882.

[2] Angelucci, Sulla rafrazione e correzione delle cornee coniche e ectatiche. Annali di Ottalm., Bd. xiii., 1884.

The results of optical correction are, however, entirely unsatisfactory in cases in which defects of vision are due to irregular corneal astigmatism. Donders recommended the correction of such cases by stenopæic glasses. He[1] and his pupil, von Wijngarden,[2] demonstrated that the improvement of vision resulting from the use of stenopæic glasses was often really astonishing, and that the narrowing of the visual field did not occasion disturbance of any kind in near vision, as, for instance, in reading and writing. For distant vision, stenopæic glasses cannot be used at all, since a patient with a greatly contracted field and good central vision would be much worse off than one with poor vision and a field of normal extent. Strange to say, it seems that Donders' proposition found no practical application—a circumstance which to me seems by no means satisfactorily explained by the uselessness of the stenopæic glasses for distant vision. Be this as it may, there are undoubtedly many patients to whom neither hyperbolic, conical, nor stenopæic glasses are of service.

Under these circumstances, searching for another means of correcting the different forms of irregular corneal astigmatism cannot be regarded as superfluous. Obviously, the most radical means would be to replace the cornea by another surface of regular curvature. This can actually be done; and I shall demonstrate in these pages that I have succeeded in excluding the defective cornea from all dioptric influences by a small glass shell, and thus, without narrowing the field of vision or the field of fixation, have increased the minimum acuteness of vision from $\frac{1}{30}$ to $\frac{1}{6}$. As a matter of fact, I could not advise the possessor of this eye to use the remedy devised by me, and which I call "a contact-lens," continually, because the fellow of her imperfect eye was approximately normal. If, nevertheless, I publish my views before any patient is wearing the "contact-lens," it is because, in the first place, I am justified in stating that, as the result of my studies already engaged in, I have solved the principle of the problem of the "contact-lens," and, secondly, because cases suitable in every respect for the contact-lens will be found much more rapidly if other ophthalmologists give the matter their attention, than if, as heretofore, I continue to search for proper cases among a limited number of eye-patients.

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[1] *Nederl. Lancet*, 1854, D. iii., S. 538.

[2] *v Gräfe's Archiv f. Ophth.*, Bd. i., 1, S. 251.

The "contact-lens" consists of a thin glass shell, bounded by concentric and parallel spherical segments. It is placed upon the eye, and the interspace between it and the eyeball is filled with a liquid having the same refractive index as the cornea. Rays of light then undergo a certain amount of refraction upon entering the liquid, which may be considered as extending forward to the anterior surface of the glass shell; but they suffer no deviation in their course whilst passing from the liquid into the cornea; and thus the irregularities in the passage of rays of light from the air into the cornea, which were previously produced, must be lost.

Of course, I began my observations with experiments upon animals, in order to ascertain whether and how long the eyeball would suffer a contact-lens to be placed upon it without suffering injury. Large rabbits proved to be admirably adapted for these experiments. In one of these animals I drew the lids and the nictitating membrane from the eyeball and filled the resulting sac with plaster-of-Paris of fluid consistence. After hardening, such a cast of the eyeball showed that the radius of curvature of the cornea did not differ materially from that of the sclera, and that the eyeball of the rabbit is pretty nearly a perfect sphere. Then I had small glass globes blown after these plaster-casts, constantly simplifying the form, until finally after many trials I abandoned the use of the casts and satisfied myself with obtaining glass vesicles, 21, 20, and 19 *mm* in diameter, and with having a segment separated from these, the base of which was distant but a few millimetres from the equator of the sphere. From a large number of such small glass shells I selected the best-fitting one for each individual rabbit. The introduction of the glass shells beneath the lids and nictitating membrane is easily accomplished, if the internal canthus be drawn forward with sufficient force by means of the thumb placed flat upon it, so that the membrane is lifted from the eyeball. The interspace between the cornea and glass is filled with liquid by drawing the upper margin of the glass away from the eyeball with a small hook, and allowing the requisite number of drops to flow from a pipette into the space thus formed.

After a series of partially unsuccessful attempts, it was found that well-fitting glasses need not be held in place by the lids at all, since they adhered to the globe. Hence it follows, that the glass accompanies the eyeball in all its movements beneath the lids, and that not a drop of the liquid escapes. As the eye does not become injected and the natural cornea is rendered invisible, it is impossible to distinguish an eye supplied with the glass from the naked eye, unless a careful examination be made. After six or eight hours there is quite a change in the picture, owing to milky clouding of the liquid. If the glass and the liquid be removed it will be also seen that the epithelium of the cornea appears slightly clouded and the conjunctiva shows moderate injection.

The microscope demonstrates that the clouding of the liquid depends upon the presence of innumerable fat-globules; these are in part of about the size of blood-corpuscles, in part, minute nuclei in rapid molecular motion. If a drop of the clouded liquid be allowed to dry upon a slide and be treated with ether, and then with a staining fluid, round cells and epithelial cells, which were easily overlooked among the numerous fat-globules of the fresh preparation, come into view. The round cells are usually collected into small groups. The epithelium contains many large and small fat-globules, within the nucleus and in the cell-body. Bacteria are absent in the great majority of cases, and when present, there are only isolated groups of a few bacilli or micrococci. As a matter of course, I disinfected the small glass shells thoroughly, and sterilized the liquid by boiling before use.

The cause of the clouding of the cornea is found in its epithelium. If a little of the clouded epithelium be scraped off and the particles be examined after staining, the cells show fat-globules in greater or lesser quantity and of larger or smaller size ; and after a little while, numerous free fat-globules can be seen between the epithelium. The result which I obtained with sections of the prepared cornea was less pronounced. But at any rate I may say that fatty degeneration was seldom or never found in the epithelium *in situ*, that in the cornea itself, the well-known inflammatory infiltration with round cells was wholly absent, and that a somewhat abundant presence of the fixed corneal cells was the only point wherein the cornea which I examined seemed to differ from the normal.

The injection of the eyeball disappears with extraordinary rapidity after removal of the glass. The degree of injection which manifests itself varies greatly, and is apt to be absent entirely in those rabbits the eyes of which have already been utilized in a long series of experiments. Apparently, therefore, a sort of toleration is established very soon.

There still remained the division of the responsibility for the three difficulties—clouding of the liquid, clouding of the cornea, and injection of the conjunctiva,—between the two exciting factors—glass and liquid. Concerning the clouding of the cornea, it was easily demonstrated that it was produced solely by the liquid. For if a glass be appplied without filling it with liquid, the cornea will remain clear; but if the glass touch the cornea at any point, or if the formation of a drop of liquid causes connection between cornea and glass, the clouding of the cornea in such cases extends exactly as far as the area of contact.

That clouding of the liquid is partly due to corneal epithelium in a state of fatty degeneration, is evident from what has been stated above. At the same time, processes seem to be set up at the points of contact between the glass and the conjunctiva of the eyeball, which result in the addition of epithelium, round bells, and the products of disorganization of these; for drops of clear serum soon form upon the inner surface of a glass applied empty, collect at the most dependent portion, and at the end of six or eight hours, are mixed and clouded with fat and cellular elements, although no change can be demonstrated in the corneal epithelium. Furthermore, I was able to demonstrate repeatedly that the filling-liquid at the periphery of the glass was clouded, whilst corresponding to the centre, it remained perfectly clear.

Finally, as to the injection of the conjunctiva, it is evident that both factors, glass and liquid, must be concerned in the cause. But since the injection was always slight, and, if glasses without filling-liquid were applied, even absent, I am inclined to charge the greater part of the responsibility to the liquid.

The problem, therefore, which presented itself to me, was to find a liquid which would cause as little irritation as possible to the cornea. Naturally this could only be discovered by numerous trials. Salt solutions, with various organic additions, alcohol solutions and glycerine solutions of different strengths, were tried without any satisfactory result. Finally a two-per-cent. solution of grape sugar was found to answer all requirements. A well-fitting glass filled with sterilized two-per-cent. solution of grape sugar is borne by the rabbit's eye for eight or ten hours without the production of any apparent clouding of the liquid, and with no clouding of the cornea or injection of the conjunctiva. However, even should these disturbances take place, it is only necessary to repeat the application of the glasses for a while daily, in order to get the eye accustomed to it, and then the desired result will surely be obtained. I would also say that any possible injection of the conjunctiva will disappear within half an hour, and any corneal clouding in the course of the night.

Are we then justified in assuming that the human eye will behave toward the " contact lens," just as we have seen that the rabbit's eye does? If this were the case, its practical applicability would be beyond question. In order to obtain properly fitting contact-lenses for the human eye, I resorted to taking plaster-casts again—naturally of the eye of the cadaver. The cast of a human eye shows very plainly that the cornea is the segment of a sphere of smaller radius of curvature than the rest of the globe. In addition, the cast showed, though less clearly, that the radius of curvature of the conjunctiva increases steadily from before backward, as we would naturally expect when we consider that only in the immediate neighborhood of the cornea does the conjunctiva lie directly upon the globe, while farther back it is separated from this by a constantly thickening layer of tendons, connective tissue, fat, and muscles. The next step was to have a glass vesicle made which fitted upon the periphery of the plaster cast; then a portion of this small glass globe was heated and a protrusion blown out, which was marked by an oval line after cooling; along this line the segment was separated, and the broken edge was made smooth by melting. Such a glass, naturally still very imperfect, was placed in the conjunctival sac of my left eye by Prof. Gaule, in whose institute I conducted these investigations; I wore it for two hours without any other subjective symptom, except some flow of tears, not, however, over the cheeks, but only into the nose. Objectively, a moderate injection, more marked at the beginning than at the end of the experiment, and which disappeared with extraordinary rapidity after removal of the glass, was observed. The liquid between the cornea and the glass remained perfectly clear, and contained, as the microscope showed, only very few organized elements—a few epithelial cells, round cells, and fat-globules. Other persons now subjected themselves to the experiment; and as subsequent trials proved still more satisfactory in relation to the subjective and objective disturbances than the first had, and since it could be demonstrated that the contact-lens adhered to the globe and held its fluid well and followed all the movements of the eyeball, without any movement of its own, except gradually a slight rotation around the long axis of the globe, I concluded to have the contact-lens made in an optically applicable form—that is, to have it ground. Unfortunately, all requisites for this were lacking here in Zurich, and therefore I wrote to Prof. Abbe, in Jena, requesting him to have several contact-lenses made for me; he was kind enough to fulfil my request. The formula which has thus far been found to be the most satisfactory in the construction of a contact-lens is the following:

A glass cornea, having a radius of curvature of 8.0 *mm*, rests with a base of 7 *mm* radius upon the glass sclera; the latter has a breadth of 3 *mm*, and corresponds to a sphere whose radius of curvature is 15 *mm;* the glass cornea has parallel surfaces, both of which are ground and polished; in the same way, the free edge of the glass sclera is ground and polished; the weight of a contact-lens is about 0.5 grammes.

If we look around among patients with irregular astigmatism, we will observe that by far the greater number of these are afflicted with corneal cicatrices. The corneal cicatrix not only alters the form,—the radius of curvature of different segments of the cornea,—but also the density of the tissue itself; and it may be assumed that the rays of light suffer deviation from their regular course, not only when entering the cornea, but also within its substance. On this account, as is known, we endeavor to relieve cases of dense central corneal cicatrices by means of an iridectomy. But this assistance is only too often insufficient, because, in the first place, it is not possible to give the artificial pupil exactly the size and shape which would correspond best to circumstances, and, secondly, because the corneal cicatrix is itself rendered luminous by the incident light, and casts over the retina a diffuse and very annoying glimmer. It has been attempted to remove the latter difficulty by tattooing leucomata; occasionally this has been followed by brilliant results. Yet the numerous precautionary measures and contra-indications that are urged by even enthusiastic adherents of tattooing, would indicate that tatooing sometimes results in very serious consequences, and even in panophthalmitis. If, however, such a patient be provided with a contact-lens which has been rendered opaque, except opposite the artificial pupil, the various optical defects will be corrected with the single exception of the defect due to the peripheric situation of the pupil; that the latter defect is not a great one, at least as far as the optical effects of the cornea are concerned, can be shown in the following manner:

A contact-lens, blackened except at a round spot placed very peripherically, is cemented upon the front glass-plate of one of Herman's hæmatinometers; the interspace between the contact-lens and the front glass-plate is filled with water, as is also the hæmatinometer; then a piece of tissue paper is pasted upon the rear glass-plate. A flame is so placed, opposite to and at a properly selected distance from the apparatus,—by a proper approximation of the tubes toward each other,—that a sharply-defined inverted image is seen upon the piece of paper. Suppose the flame to have been placed on the prolongation of the line connecting the centre of the contact-lens with the aperture—that is, to the side of the axis of the hæmatinometer, after arranging the apparatus, then the image of the flame will be found the most distinct; but it will not become materially altered, if the flame be brought nearer the axis. Not until the flame passes the axis and is placed upon the opposite side of it from the aperture does the image begin to become indistinct; naturally this becomes more so the farther the flame is removed from the axis.

Besides the numerous cases in which the corneal cicatrices diminish the acuteness of vision by irregular refraction and dazzling, there are, though less frequently, cases of irregular astigmatism with clear corneæ. To this class, cases of keratoconus belong; also those cases in which peripherally situated cicatrices, as, for instance, cicatrices as a result of cataract operations, have caused distortion of the cornea. Assuming that there is no impediment to rays of light beyond the cornea, there is no doubt that the optical defect can be fully corrected by the contact-lens. At the same time the high degree of hypermetropia in aphakia could be diminished by increased curvature of the glass cornea.

Finally, we might also consider the advisability of allowing myopes of high degrees, whom we do not dare to give correcting glasses, to wear contact-lenses whose glass corneæ would naturally want to be correspondingly less curved than those heretofore used by me.

It was now important to secure patients upon whom tests based upon the preceding observations could be made. Professor Haab was kind enough to place the material of the Ophthalmological Poliklinik at my disposal. I then searched the records for those cases which seemed suitable for trial of the contact-lenses. Among these had to be excluded all out-of-town patients, because the expense of having them come to Zurich would have been too great. Thus there were seventeen patients left, and this number dwindled considerably, since a few could not be found, others had died, and still others did not respond to a request to present themselves at the clinic because they had become reconciled to their condition. Thus there were altogether ten patients for examination, among which there were four again who had to be sent away because they proved entirely unsuitable. The experiment applied to the remaining six gave the following results:

No. 1.—J. U. Both sides, central macula corneæ, anterior polar cataract, and some nystagmus. Left: counts fingers at one metre; after dilating pupil only at three quarters of a metre; with contact-lens, lateral aperture, fingers at two metres. Right: S almost $\frac{2}{18}$; after dilating pupil, only $\frac{1}{60}$; with contact-lens, no improvement.

No. 2.—Mrs. L. Maculæ corneæ of both sides. Right: $S = \frac{6}{24}$; with contact-lens with blackened centre, $S = \frac{6}{18}$.

No. 3.—K., carpenter, ; keratoconus on both sides. Left: $S = \frac{6}{60}$; with contact-lens, $S = \frac{6}{36}$ (also a few letters of 24).

No. 4.—P. H. Left: anophthalmus. Right: central maculæ corneæ; $S = \frac{4}{13}$; with contact-lens, blackened centre, $S = \frac{4}{9.75}$.

No. 5.—O.M. Right: normal. Left: leucoma adhærens, below; pupil oval, vertically; $S = \frac{4}{36}$; with contact-lens, $S = \frac{4}{24}$, some letters.[1]

No. 6.—A. G. Right: normal. Left: maculæ corneæ; counts fingers at two metres; after dilating pupil, $S = \frac{1}{30}$; with contact-lens, entirely blackened except one sector, $S = \frac{2}{12}$.

It will be seen, that among the preceding cases, only one was benefited sufficiently in acuteness of vision to have made it worth while to continue these preliminary experiments, in order to increase the acuteness of vision still more by obtaining a greater correspondence between the maculæ and the blackened portions of the contact-lens, to have justified proceeding systematically to accustom the eye to the glass, and to have the girl's folks gradually taught how to fill and apply the contact-lens. I would naturally have been very glad to have taken this trouble, but since the other eye of the girl was almost normal, I did not consider myself justified in continuing the experiment, since I could not expect a result which would have been of practical value to the girl. Nevertheless, this case taught me that, among the exceedingly numerous patients with opacities of the cornea, there are certainly those who can be benefited by the use of the contact-lens, provided, naturally, the eye corrected by the contact-lens is the better and not the worse one, as in Case 6.

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[1] This eye was evidently amblyopic, since a dioptric acuteness of vision of almost = 1 might have been expected.

Hoping that other oculists will also endeavor to employ the contact-lens, I will communicate several matters of technique:

Introduction is best accomplished by seizing the small glass between the index finger and the thumb of the right hand, at the same time lifting the upper lid of the patient's eye with the left, and requesting him to look down ; now the glass is pushed beneath the upper lid, and whilst the patient looks up and thus carries the contact-lens upward, the lower lid is drawn forward somewhat, and the contact-lens adjusted to the eyeball. In order to supply the liquid : While an assistant or the patient himself lifts the upper lid, the upper portion of the margin of the lens is slightly drawn from the eyeball by means of a squint-hook, and with the unemployed hand the sugar solution, well warmed, is allowed to drop upon the eyeball from a pipette with bent extremity. To remove the lens again, it is only necessary to lift the lower portion of the margin of the glass with a squint-hook, while the patient is looking up, and then to have the patient look down ; during the downward movement the lens becomes detached and is caught in the patient's handkerchief. Occasionally, removal is easier if the proceeding be reversed : Have the patient look down, separate the upper margin, and then look up. That the band and the glass must be aseptic, and the sugar-solution sterilized, is a matter of course. If the lens fits well, the patient does not complain, has no flow of tears, and either has no injection of the ocular conjunctiva, or very little. If symptoms of irritation show themselves, the glass must be removed. My experience indicates that the irritation is usually produced by some part of the margin of the glass sclera becoming somewhat separated from the eyeball, and in this way rubbing against the lid during movements of the eyeball. Strange to say, the filling-liquid does not necessarily escape in such cases. Despite clumsy manipulation on the part of the patients, injury to the corneal epithelium did not occur in a single case.

An inquiry from one of the patients led me to believe that possibly contact-lenses will be often worn for purely cosmetic reasons. Those eyes which are terribly deformed by leucomata and yet should not be enucleated while some vision remains, since they would be quite valuable should the fellow eye be lost, can be changed so that they no longer attract the attention of other persons, by the use of a contact-lens upon which the iris and a black pupil is painted. So that there would be the same result, respecting movement, as from an artificial eye, with the additional advantage that the eyeball would not need to be sacrificed as in the former case.

In conclusion, it gives me pleasure to express my most sincere thanks to Prof. Gaule of Zurich, Prof. Abbe of Jena, and to Prof. Haab of Zurich, for assistance given me.

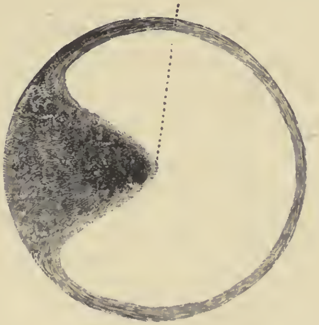
ZURICH, September, 1887.

EXPERIMENTAL SCOTOMA BY PRESSURE ON THE EYEBALL.

DR. CARL KOLLER, NEW YORK.

WHEN the eye (whilst the other eye is kept closed) is directed to a dimly illuminated white surface, and at the same time a slight pressure is exerted with the finger through the eyelid upon the eyeball, the following phenomenon is observed:

Opposite the place of pressure the well-known round black spot appears, which corresponds to the pressure-phosphene, and which, as is well known, always is observed when the retina while being exposed to light is irritated mechanically at any point. But on the white surface another brown-gray spot appears of almost triangular shape; the apex of the triangle occupies the point of fixation, while its base is turned outwards. The spot is darkest near the apex; towards the base it is of a lighter shade. From the end of the base crescentric prolongations extend, which, turning back, form a circle, the centre of which is the apex of



the triangle—*i.e.*, the point of fixation. The phenomenon lasts hardly more than two seconds, and disappears with a peculiar glimmering sensation. Its position is always the same, no matter on what part of the eyeball the pressure may be exerted. It may be stated that the black spot (corresponding to the pressure-phosphene) and the phenomenon just described show an apparent opposite movement. The pressure-phosphene, in short, lies (as caused by an irritation of a peripherical part of the retina) in the periphery of the field of vision, and it is projected near to some part of the face, consequently in a plane nearer to the eye than the point of fixation. While the pressure is being exerted, though lasting but a very short time, the phosphene grows larger, until the pressure has reached its maximum; the consequence is that the more distinct central border seems to move towards the point of fixation. But the spot at the point of fixation shows an opposite movement, because the eye is displaced by the pressure—a movement in which, of course, the dark-gray spot participates. Therefore both spots appear to move towards each other like scenes. I first observed this transient positive pressure-scotoma about two years ago; I could not find any reference to it in the literature. Several colleagues, to whom I communicated the matter, saw the phenomenon just as I do.

For an explanation I am at a loss. When the positive pressure-scotoma is studied in its topic relation to the blind spot, it appears to extend from the point of fixation 5° in the direction of the blind spot. That is almost the same position occupied by the paracentral scotoma, the well-known symptom in retrobulbar neuritis.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE THIRD QUARTER OF THE YEAR 1887.

By H. MAGNUS, Breslau; C. HORSTMANN, Berlin; and A. NIEDEN, Bochum.

WITH THE CO-OPERATION OF

C. E. Fitzgerald, Dublin; E. Marckwort, Antwerp; P. von Mittlestädt, Metz; Dantone, Rome; Hirschmann, Charkow; S. M. Burnett, Washington; Schiötz and Ole Bull, Christiania, etc.

Sections I.–V. Reviewed by Prof. H. MAGNUS.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

264. Arlt. Events of my life. Wiesbaden, 1877.

265. Barr, Elmer. On photographing the interior of the human eyeball. *Amer. Jour. Ophth.*, July, 1887.

266. Chodin. Practical ophthalmology. Hand-book for students and physicians. Third enlarged edition. With 157 illustrations. St. Petersburg, 1887.

267. Hirschberg. Dictionary of ophthalmology. Leipzig, 1887.

The principal difficulty in photographing the fundus of the eye lies in the want of a substance sensitive to red rays. Barr (265) has succeeded in obtaining an orthochromatic bath, with a solution of erythrosin, which, although not perfect, is the best yet found and fairly successful. The formulas for preparing the bath, etc., are given. Burnett.

Hirschberg (267) traces the most important ophthalmological terms and names in their gradual development from their very beginning through the whole literature of the ancients and compares them with their present meaning.

b.—STATISTICAL PAPERS.

268. Lawrentjew. Report on the ophthalmic section of the St. Petersburg Nicolai Military Hospital, for the year 1886. *Wojeno Med. Jour.*, Sept., 1887.

Lawrentjew (268) presents statistics, not suitable for recording. He tried injections of carbolic acid in trachoma according to Schtschepkin, but with negative results. He also describes a case of binocular, congenital microphthalmus, with $V = \frac{20}{30}$ in the right and $\frac{20}{200}$ in the left eye.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

a.—GENERAL PATHOLOGY.

269. Beaunis. Lésions atrophiques à la suite de l'arrachement du facial. *Gaz. hebd. de méd. et de chir.*, 1887, p. 235.

270. Hess. On the naphthaline changes in the eye of the rabbit. Report on the nineteenth meeting of the Ophthalmological Society at Heidelberg, 1887, p. 54.

271. Magnus. The influence of naphthaline on the organ of sight. Paper read before the section for ophthalmology of the sixtieth meeting of naturalists at Wiesbaden. *Therapeutische Monatshefte*, Oct., 1887.

272. Parisotti. Sur l'ossification dans l'œil. *Rec. d'ophth.*, 1887, p. 462.

272*a.* Power. Microbes in the development of eye diseases. Internat. Med. Congress at Washington. *Med. Rec.*, 1887. The debate was interesting, but did not bring out any thing new.

Beaunis (269) observed atrophic changes in the eye and similar ones in the ear of a rabbit three years after the facial nerve had been torn out. Laborde saw the same after simple division of the facial nerve. Brown-Sequard also observed such changes from the same cause. Marckwort, Hess (270), and Magnus (271) found the same clinical changes in the eye as the French authors following the introduction of naphthaline into the eye; neither, however, observed liquefaction of the vitreous, but they noticed that the development of the opacity of the lens has absolutely no connection with the naphthaline affection of the retina. The changes in the latter, according to Hess, begin in the epithelial cells, which group themselves in a peculiar manner, generally around small crystals. Hess failed to find an exudation between the epithelial layer and retina, as described by Panas. In regard to the naphthaline cataract, Magnus and Hess agree; it is due to the formation of fissures in the lens, usually beginning at the æquator and posterior pole. The process, however, is not a specific one, and it seems probable that the mode of development is the same in all forms of cataract.

PARISOTTI (272) made a histological examination of three eyeballs containing osseous tissue. He does not fully agree either with Knapp or with Becker, and concludes that osseous tissue can take the place of normal tissue in any part of the eye, after the latter tissue has disappeared and been replaced by connective tissue, which is the true and only starting-point of ossification.

MARCKWORT.

b.—GENERAL THERAPEUTICS.

273. BARABAN et ROHMER. Recherches sur la greffe oculaìre. Expériences sur la greffe intra-peritonéale de l'œil. *Arch. d'ophth.*, vol. vii., 4, p. 289.

BARABAN and ROHMER (273) describe, with the aid of plates, the condition of twelve eyes transplanted into the peritoneal sac of guinea-pigs, after they had remained there for a period of time varying from eighteen hours to ninety-four days. The changes are numerous and interesting; for details the original must be consulted. After eighteen hours the rods and cones have almost entirely disappeared, and the volume of the vitreous has been diminished. After thirty-six hours the retina, the epithelium of Descemet's membrane, and the lens have disappeared; the latter is enlarged. After forty-eight hours the uveal pigment also is gone. After three days the epithelium of the cornea is detached here and there, and the latter swollen. After five days the eye is firmly adherent, the sclera thickened and infiltrated, the deeper layers of the cornea seem mortified, the lens splitting up æquatorially. After ninety-two days the eye has become much smaller, the cornea vascular, the sclera atrophic and almost devoid of blood-vessels, the lens small and chalky. As such marked atrophy set in under conditions so favorable for the nourishment of the eye, the authors conclude that the transplantation of an eye into the orbit for cosmetic purposes is an impossibility. They also believe that although a transplanted cornea may remain clear for a long time, it will finally be converted into opaque connective tissue. They think the time is not yet ripe for transplantation of the cornea in man, in opposition to the experiments of v. Hippel and the case lately reported by the latter. v. MITTELSTÄDT.

274. BECKER. On exenteration and enucleation. Sixtieth meeting of German naturalists and physicians at Wiesbaden.

BECKER (274) makes exenteration in panophthalmitis. Results thus far favorable. A child did not cry during the operation, which, as Becker concludes, must be painless. The child could be discharged from the hospital in four days.

275. BUNGE. On exenteration of the eye. Communications from the ophthalmic clinic of the university at Halle a. d. S. Halle a. d. S., 1887.

276. MASE. On exenteratio bulbi. *Inaug. Diss.*, Kiel, 1887.

BUNGE (275) repeats the views of A. Graefe on exenteration. The operation is justified (1) because it removes only the diseased portion of the eye ; (2) because the stump obtained is much better adapted for the wearing of an artificial eye than that obtained by enucleation ; (3) because exenteration insures better protection against meningitis ; and (4) because it can be performed more quickly and easily than enucleation. Neurotomy should only be done in blind eyes showing no tendency to a change in volume and containing no septic focus. Enucleation is principally indicated in tumors. According to the latest experience of Graefe, exenteration can even cure sympathetic ophthalmia after it has once broken out. The statistics of two hundred enucleations performed at Halle are also of great interest.

MASE (276) favors exenteration.

277. CONNOR. Treatment of eye-diseases with hot water. Internat. Med. Congr. at Washington. *Med. Rec.*, Sept., 1887.

278. LANG. On the insertion of artificial globes into Tenon's capsule after excising the eye. Ophth. Soc. Unit. Kingd. *Brit. Med. Jour.*, May, 1887.

279. ROHMER. De l'antisepsie en oculistique. *Rev. gén. arch. d'ophth.*, vol. vii., 4.

CONNOR (277) recommends hot-water baths for the majority of eye-diseases ; he even does not know of any contra-indications.

LANG (278) substitutes globes of glass, silver, or celloidine for the enucleated eyeball. Tenon's capsule is closed with deep sutures over the artificial eyeball, conjunctiva with superficial sutures.

In the continuation of his paper on antiseptics in eye-surgery, ROHMER (279) discusses the antiseptic methods of treating corneal affections, and then discusses antiseptics in operations on the external parts and in operations in which the eyeball is opened. He discusses in particular the measures to be adopted before, during, and after an operation, speaks of the views and methods of various authors, but on the whole offers nothing new.

V. MITTELSTÄDT.

III.—INSTRUMENTS AND REMEDIES.

a.—INSTRUMENTS AND TECHNICAL CONTRIVANCES.

280. BULL, GEO. An optometer. Report on the nineteenth meeting of the Ophthalmological Society at Heidelberg, 1887, p. 192.

281. FITZGERALD. Apparatus for the rapid determination of refraction. Report on the nineteenth meeting of the Ophthalmological Society at Heidelberg, 1887, p. 204.

282. V. HOFFMANN. Apparatus for washing out the anterior chamber with antiseptic liquid. Do., p. 208.

283. KROLL. Stereoscopic test-types for detecting simulation, monocular amblyopia, or blindness. Crefeld, 1887. Very useful; completes the plates which have previously appeared.

284. LEROY. Le phénomène de l'ombre pupillaire. Théorie et application à la mesure des amétropies. *Rev. gén. d'ophth.*, 1887, p. 289.

285. MASSELON. L'ophthalmoscope Helmholtz-Wecker. *Ann. d'ocul.*, vol. xcviii., p. 24.

286. WOLFFBERG. New bandage. *Klin. Monatsbl. f. Augenhk.*, Sept., 1887.

BULL (280) has constructed an optometer especially intended for rapid determinations; complete relaxation of the accommodation is necessary, so that it can hardly be used without controlling it by some other method.

FITZGERALD (281) has also constructed an apparatus for the quick determination of refraction; in principle it resembles the refractometer of Rodenstock.

LEROY (284) attempts to explain scientifically the determination of refraction by means of the pupillary shadows. He prefers this method to that of the upright image. MARCKWORT.

WECKER (285) has constructed another ophthalmoscope for the determination of refraction by the upright image. Instead of an ordinary mirror, Wecker uses three glass plates, after the manner of the instrument of Helmholtz. The new ophthalmoscope of Wecker consists of three plane glasses, held together by a ring attached to a handle. The black plate perforated at the centre has been discarded. To determine the refraction, the glasses from a test case can be inserted behind the plates. MARCKWORT.

b.—REMEDIES.

287. FANO. Valeur de l'hydrochlorate d'apomorphine employé comme anesthétique local de l'œil. *Journ. de méd. et de chir.*, August, 1887.

288. LEROUX et DUBOIS. Action du chlorure d'éthylène sur la cornée. *France méd.*, July, 1887.

289. PANAS. Salicylate de lithoise dans les affections oculaires rhumatismales. *Journ. de méd. et de chir.*, 1887, p. 213.

290. POST, M. H. Antipyrine as an analgesic in inflammations of the eye. *Amer. Journ. Ophth.*, July, 1887.

FANO (287) tested the anæsthetic action of apomorphine upon the eye, but found it very slight, and therefore prefers cocaine. MARCKWORT.

DUBOIS and LEROUX (288) tested the anæsthetic effects of the inhalation of chlorous æthylene on animals, and made the following observation on this occasion: During the first hour and a half the tension of the eyes decreased, but after sixteen to eighteen hours the tension was increased, and a bluish, opalescent opacity of the cornea appeared, so that the latter lost its transparency; after thirteen days it began to clear up slightly. MARCKWORT.

POST (290) has used antipyrine as an analgesic in various forms of painful affections of the eye, and with great benefit. He gives ʒi. divided into three or four powders, one to be taken every two hours until pain abates. BURNETT.

IV.—ANATOMY.

291. BORYSIEKIEWICZ. Examinations on the finer structure of the retina. Vienna, 1887.

292. CLAEYS. De la region ciliaire de la rétine et de la zonule de Zinn. *Bull. de l'acad. royale de méd. de Belgique*, vol. xx., 3 series, No. 11.

293. Kollock, C. W. A case of venous anastomosis on the disc. *Med. News*, Aug. 6, 1887.

294. Lange. Topographical anatomy of the contents of the human orbit in plates. Braunschweig, 1887.

295. Motais. Anatomie moteur de l'œil de l'homme et des vertébrés. Paris, 1887.

296. Schlösser. Experimental study on traumatic cataract. Munich, 1887. (v. these Arch., vol. xviii., p. 194, Ger. ed.)

297. Sattler. Anatomical and physiological contributions to the accommodation. Report on the Nineteenth Meeting of the Ophthalmological Society at Heidelberg, 1887.

298. Swjagintew. On the normal relative width of the pupil of healthy persons. *Russkaya med.*, 1887, No. 28.

Borysiekiewicz (291), in an elaborate paper, endeavors to overturn our present views of the histology of the retina in many important points. We cannot enter into any details here, and therefore will draw attention only to some of his principal assertions. Thus he maintains that the rods and cones are not the terminations of the nerve fibres, but of Müller's radial fibres; neither are they isolated formations regularly arranged beside one another; the rods are changed to cones by the entrance of an outer nucleus from the granular layer. There is no foundation for assuming that the rods and cones are the specific percipient apparatus, the other layers being equally entitled to this function. He claims that we can only say that the percipient portions lie in Müller's fibres in a space extending from the inner to beyond the outer granular layer.

Claeys (292) was able to demonstrate in man also the existence of circular fibres in the zonula, which, as long ago as 1870, had been shown to exist in the sheep. Marckwort.

In Kollock's (293) case there was a connecting branch between the superior nasal and superior temporal branches of the retinal vein. Burnett.

Lange (294) prepared his excellent plates in the following manner: The eyeball was removed as soon as possible after death, hardened as usual, embedded in celloidine, and divided into a series of frontal sections with a microtome. The sections were stained with hæmatoxyline or eosine respectively, and placed on slides. These sections were projected with the aid of a magic-lantern and a special apparatus on drawing-paper, and drawn under a magnifying power of five diameters. In this manner Lange has prepared really excellent plates.

MOTAIS (295) has published an elaborate monograph on the muscles of the eye and Tenon's capsule. Meyer reviews it very favorably (*rev. gén. d'ophth.*, 1887, p. 356), but also calls attention to some errors. MARCKWORT.

SCHLÖSSER (296) assumes a system of gaps and fissures in the lens in which the lymph circulates. The lymph stream enters the lens at the æquator, passes near the posterior capsule to the centre of the posterior cortex, and thence through perinuclear canals to the lenticular star of the anterior cortex ; the points of exit lie in the anterior capsule in the form of a circle, which corresponds to the insertion of the fibres of the zonula.

SWJAGINTEW (298) has examined the width of both pupils in 232 healthy persons, and concludes that an unequal width is a rare and changeable phenomenon. To the cases of anisocoria observed by Pasternatzky in diseases, he adds others of unequal size of the pupils in intermittent fever and tubercular pneumonia.

HIRSCHMANN.

V.—PHYSIOLOGY.

a.—CENTRAL ORGAN AND RETINA.

299. DARKEWITSCH. What part do the upper corpora quadrigemina take in transmitting the irritation caused by light to the nucleus of the oculomotor nerve? *Med. Obosrenije*, vol. xvii., No. 9.

300. SCHMIDT-RIMPLER. The influence of peripheral irritation of the retina on central vision. Report on the nineteenth meeting of the Ophthalmological Society at Heidelberg. (v. these ARCH., vol. xviii., p. 198, Ger. ed.)

From investigations on rabbits DARKEWITSCH (299) concludes that when the upper corpora quadrigemina are injured by a sagittal section in the median line (between the two anterior corpora), dilatation of the pupils and destruction of the pupillary reaction follow, the same as after complete division of the oculomotor nerve. A sagittal section which injures the upper corpora quadrigemina laterally (from the median line) produces dilatation and destruction of the reaction of the pupil of the same side ; the pupil of the other side is only slightly dilated, and does not respond to light as readily as usual. Injury of the lateral side of a corpus quadrigeminum has no effect on the movement of the iris. The nuclei and paths of the oculomotor nerve remained uninjured, as was shown histologically. Injury of the upper corpora quadrigemina therefore gives rise to the same symptoms as that of the posterior cerebral commissure, which transmits the irritation of light from the retina to the nuclei of the oculomotor nerve. The path also passes on through the substance of the upper corpora quadrigemina, above the aqueduct of Sylvius.

HIRSCHMANN.

b.—LENS.

301. HILL, GRIFFITH. On the permeability of the suspensory ligament by organized substances in descemetitis. Trans. Ophth. Soc. Unit. Kingd. *Brit. Med. Jour.*, May, 1887.

302. SCHÖN. On the changes in the eye due to accommodation with advancing age. Report on the 19th meeting of the ophthalmological Society at Heidelberg 1887. (v. these ARCH., vol. xviii., p. 203, Ger. ed.)

HILL, GRIFFITH (301) believes that solid particles can be transported through the zonula and deposited in the anterior chamber.

c.—COLOR PERCEPTION.

303. KNIES. On primary colors. Report on the 19th meeting of the Ophthalmological Society at Heidelberg, 1887. (v. these ARCH., vol. xvii., p. 379, and vol. xviii., p. 50, Ger. ed.)

304. THOMPSON. Color-blindness among railroad employés. *Med. News*, August, 1887.

THOMPSON (304) reports the results of an examination of 25,158 railroad employés. Among them 481 were color-blind.

BURNETT.

Sections VI.—XI. Reviewed by DR. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

305. NORTON, G. S. Connection between low degrees of astigmatism and headache and asthenopia. Ninth international med. Congress, at Washington, 1887.

306. QUERENGHI. Microftalmo congenito con stafiloma posteriore progressivo. *Ann. di ottalm.*, vol. xvi., 2–3, p. 190.

307. THUR, U. Spasmus ciliaris partialis varians. Genees-Kundig *Tijdschrift voör Nederlandsch Indie Deel*, xxvii., 1, p. 91.

308. TIFFANY. Ametropia. Ninth internat. med. Cong., at Washington, 1887.

NORTON (305) reports a number of cases in which vision was materially improved with the aid of very weak cylindrical glasses ($\frac{1}{4}$D).

QUERENGHI (306) examined an illiterate recruit whose left eye was highly myopic (M = 18D), and presented at its fundus an extensive conus enclosing the whole papilla, besides numerous atrophic spots in the choroid. The right eye was about one third smaller than a normal eye, was hypermetropic (H = 6D, with the ophthalmoscope), and presented the same choroidal changes as the left eye. It was amblyopic on account of partial cataract.

DANTONE.

U. THUR (307) reports a case in which he found in an engineer, aged 30, in the right eye $M\ 1D \asymp -0.50^c$, in the left eye $M\ 2.50D \asymp -1D^c$. Cylindrical did not improve his sight, but the stenopaic apparatus did. After instilling atropine he did not find any astigmatism. The papillæ and retinæ were hyperæmic. Four days later he again found astigmatism with the aid of the stenopaic apparatus, but the meridians rotated to the right about 30°. Cylindrical glasses again caused very unpleasant sensations. In the course of further examinations he discovered that the principal meridians changed their positions at short intervals. The patient was once more put thoroughly under the influence of atropine. The hyperæmia slowly decreased. WESTHOFF.

TIFFANY (308) reports the results of the examination of the eye of 2,000 school children of the white, the red, and the black race.

VII.—LIDS.

309. BURCHARDT. The operation of trichiasis. *Centralbl. f. prakt. Angenhk.*, 1887, p. 289.

310. HOTZ, C. F. Restoring the normal position of the free tarsal border in trichiasis. Ninth internat. med. Cong., at Washington, 1887.

311. JACOBSON, J. An operation for trichiasis. *Centralbl. f. prakt. Augenhk.*, 1887, p. 193.

312. PITTS, B. The best method of operating for entropium. Ninth internat. med. Cong., at Washington, 1887.

313. WEBSTER, D. On the adaptation of Corning's method of producing local anæsthesia by cocaine to operations on the eyelids. *Med. Record*, March 5, 1887.

BURCHARDT (309) operates in almost the same manner as Jacobson, but always takes the flap from the skin of the lid.

Jacobson (311) recommends the following operation for trichiasis: after making the intermarginal incision according to Jaesche-Arlt, a thin strip of skin is circumcised, generally from the temporal end of the intermarginal incision, either perpendicularly, upward, or downward from the face of the skin, or at an obtuse angle from the skin of the temple or lid. After the skin has been loosened to about 4 *mm* below the end, a fine curved needle with a silk thread is then passed through from the outside, and the end then detached. The strip is then carefully adjusted in the intermarginal space and its extremity attached at the nasal end. With the same needle the upper edge of the strip is then attached in three places to the points of exit of the eyelashes, while a stronger needle is used in fastening the lower edge in three places to the free edge of the cartilage. The wound in the skin is then closed and an iodoform bandage applied.

VIII.—LACHRYMAL APPARATUS.

314. Fontaine-Algier. Hémorrhagie grave, à la suite d'un debridement du sac et du canal lacrymal. *Rev. clin. d'ocul.*, 1887, No. 9, p. 193.

After an extensive division of the upper lachrymal duct in dacryocystoblennorrhœa, Fontaine-Algier (314) introduced Stilling's knife into the naso-lachrymal duct, and immediately afterwards saw a severe hemorrhage from the left nostril, necessitating the introduction of a tampon, after the patient had lost 700-800 grms. of blood. The author thinks he struck a large blood-vessel which had an unusual course.

v. Mittelstädt.

IX.—MUSCLES AND NERVES.

315. Abadie. Faulty movements of the eyes, and the means of correcting them. Ninth internat. med. Cong. at Washington, 1887.

316. Alt, A. The orthopædic method of treating paralysis of the ocular muscles. *Amer. Journ. Ophth.*, 1887, No. 4, p. 101.

317. Béard. L'ophthalmoplegie nucléaire. *Arch. génér. de méd.*, 1887, No. 1.

318. Beevor, C. E. Ophthalmoplegia externa. Ophth. Soc. Unit. Kingd., March 10, 1887.

319. Ewetzky, F. O. Ophthalmoplegia externa after diphtheria of the throat. *Med. Obosrenije*, 1887, vol. xxvii., No. 9.

320. Fano. Exophthalmos dans la paralysie des muscles droits de l'œil. *Journ. d'ocul. et de chir.*, Oct. 1887, p. 91.

321. Gowers. Conjugate palsy of the ocular muscles and nystagmus. Ophth. Soc. Unit. Kingd., March 10, 1887.

322. Hinde, A., and Moyer, H. N. Periodically occurring oculomotor paralysis. *Med. Record*, Sept. 24, 1887.

323. Jessop. Case of sudden and lasting lateral nystagmus, most marked when looking to the left. Ophth. Soc. Unit. Kingd., March 10, 1887.

324. Kojewnikoff. Ophthalmoplégie nucléaire. *Progr. méd.*, 1887, No. 36, p. 179; No. 37, p. 196.

325. Landolt, E. Binocular vision after strabismus operations. *Brit. Med. Journ.*, 1887, p. 664.

326. Landolt, E. Operation for strabismus. Ninth internat. med. Congr. at Washington, 1887.

327. Mittendorf, W. F. Associate external ophthalmoplegia or complicated paralysis of the external muscles in both eyes. *Journ. of Nervous and Mental Diseases*, vol. xiv., Feb., 1887.

328. Mules, Ph. H. Squint, concomitant convergent. *Brit. Med. Journ.*, 1887, p. 661.

329. Shakespeare, E. O. On the strength of the superior recti muscles as a cause of asthenopia. Ninth internat. med. Congr. at Washington, 1887.

330. Snell, Simeon. On the etiology and treatment of convergent squint. *Brit. Med. Journ.*, 1887, No. 1395, p. 657.

331. Stevens, G. F. Some important problems respecting insufficiency of the ocular muscles. Ninth internat. med. Congr. at Washington, 1887.

332. Taylor, Sidney. Miners' nystagmus. *Brit. Med. Journ.* 1887, No. 1391, p. 483, and No. 1394, p. 623.

333. Testaz. Paralysie douloureuse de la septième paire. *Thèse de Paris*, 1887.

Abadie (315) discusses the cases of squint in which partial or total tenotomy is necessary to correct it.

In a girl aged eight, Ewetzky (319) observed complete ptosis of both lids and paralysis of all the external ocular muscles (there was only slight mobility in the horizontal meridian), while the accommodation was not affected, and the pupils narrow, rather than wide. Two weeks previously she is said to have had a slight angina. After the lapse of a month all the symptoms of paralysis had disappeared. In the preservation of the power of accommodation, Ewetzky sees the proof of a central cause of the paralysis.

HIRSCHMANN.

FANO (320) discusses a case of unilateral exophthalmus with paralysis of all the muscles in an eye blind from atrophy of the optic nerve. The cause was cerebral. The paralysis was cured, and the exophthalmus disappeared at the same time. When all muscles of the eye are paralyzed, the exophthalmus is caused by the elasticity of the bands which pass from Tenon's capsule to various points around the base of the orbit. Under normal conditions the muscles pull the eyeball back into the orbit, and this traction ceases when the paralysis sets in.

MARCKWORT.

HINDE and MOYER (322) give the history of a case and abstracts from the literature respecting this singular affection. The patient, a girl of twenty years, began to have these periodical attacks of ptosis and divergent strabismus in the left eye in her seventh year, having from one to three or four attacks a year. During the last six months she has had four attacks, and the condition has become permanent. No cause is assigned.

BURNETT.

LANDOLT (325) recommends stereoscopic exercises for bringing about binocular vision after strabismus operations.

MULES (328) believes that concomitant convergent strabismus depends upon the coexistence of hypermetropia, and appears before binocular fixation is established.

SHAKESPEARE (329) believes that not only the internal and external recti, but also the superior recti muscles may give rise to asthenopic troubles. He corrects insufficiency with prisms properly placed, or with decentred glasses.

According to SNELL (330) convergent strabismus stands in direct connection with hypermetropia, ninety-five per cent. of all thus affected being hypermetropic. It rarely appears before the third or after the eighth year. Usually the squinting eye is amblyopic ; the refraction of the eyes is often different, the squinting eye being generally more hypermetropic than the other. Snell recommends glasses in the beginning, afterwards tenotomy.

TESTAZ (333) discusses the unilateral facial pains which precede paralysis of the seventh nerve. He thinks it possible that with greater experience, the time elapsing between the appearance of the pain and that of the paralysis may be utilized for the prognosis of the latter. It seems to him that the shorter this time the better the prognosis. MARCKWORT.

X.—ORBIT AND NEIGHBORING CAVITIES.

334. ABADIE. Considérations cliniques et thérapeutiques sur les tumeurs de l'orbite. *Union med.*, 1887, p. 969.

335. CRITCHETT, A. A case of orbital cellulitis. Ophth. Soc. Unit. Kingd., 1886, p. 155.

336. HUTCHINSON, J. Graves' disease. Do., 1886, p. 23.

337. TANGEMAN, C. W. Gummy tumors of the orbit. *Cincinnati Lancet Clinic*, vol., xvii, No. 26, p. 789.

338. WALKER. Pulsating exophthalmus in process of cure. Ophth. Soc. Unit. Kingd., June 9, 1887.

ABADIE (334) removed an orbital tumor in a man aged 50, and penetrated so deep that he made a large opening leading from the orbit into the cranial cavity. In consequence of the antiseptic precautions no meningitis developed, the healing being normal. As the tumor proved to be a sarcoma a relapse is probable.

MARCKWORT.

CRITCHETT'S (335) case was that of a young lady, aged 16, who suffered from a severe attack of orbital cellulitis of the right side, which was cured by an incision into the orbit. A few days later her sight in the left eye began to diminish, while that of the right improved. After the lapse of 36 hours, sight in the left eye became normal, while that of the right became worse. These alternations took place several times, until finally sight became normal again. No cause could be found, except that the patient had eleven bad teeth.

In the course of a discussion in the English Ophthalmological Society on Graves' disease, HUTCHINSON (336) remarked that he attributed the disease rather to a functional disturbance than to an organic change. Hughlings-Jackson thinks it is probably of central origin, and cites the experiments of Brown-Sequard and Filehne, who observed exophthalmus after injury of the corpus restiforme.

WALKER'S (338) case was that of a boy in whom five years after an injury pulsating exophthalmus developed. It was probably due to a rupture of the internal carotid into the cavernous sinus. Improvement took place after a bruising of the eye.

XI.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

339. ABERNETHY. A form of gonorrhoic conjunctivitis not dependent upon inoculation. *Chicago Med. Journ. and Examiner*, May, 1887.

340. FICK, E. On micro-organisms in the conjunctival sac. Wiesbaden, 1887, J. F. Bergmann. A well-written monograph of 73 pages and one plate.

341. LANG. Pemphigus of the conjunctiva. Ophth. Soc. Unit. Kingd., 1886, p. 124.

342. MAGNUS, H. A case of blennorrhœa neonatorum implicating the cornea and acquired in utero. *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 389.

343. ONODI, A. Contribution to the knowledge of blennorrhoic conjunctivitis. *Centralbl. f. d. med. Wissensch.*, 1887, No. 13.

344. POMEROY, O. D. A case of wellnigh fatal hemorrhage from the conjunctiva in an infant. *Med. Rec.*, Aug. 20, 1887.

345. v. REUSS. Tuberculosis of the conjunctiva. *Wiener med. Presse*, 1887, No. 17.

346. SCHMIDT-RIMPLER, H. Pemphigus of the conjunctiva. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxv, p. 379.

347. SCHMIDT-RIMPLER, H. Death due to hemorrhage from the conjunctiva. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 383.

348. SEREBRENNIKOWA, E. P. The treatment of trachoma. *Wratsch*, 1887, No. 32.

349. THEOBALD, S. The pathogenesis of pterygium. *Amer. Journ. Ophth.*, 1887, No. 8.

350. TILLY. R. A case of pemphigus of the conjunctiva with remarks. *Amer. Journ. Ophth.*, 1887, No. 6, p. 145.

ABERNETHY (339) observed a number of cases in which urethritis and inflammation of the joints were accompanied with gonorrhoic conjunctivitis, though direct transmission could not be proven.

In order to study the harmless, not pathogenic micro-organisms in the conjunctival sac, FICK (340) examined the discharge from 85 eyes of 57 beneficiaries of the Julius Hospital at Würzburg, who either had normal eyes or only chronic cartarrhal affections. In only six of the 85 cases no micro-organisms were found. In only one beneficiary both eyes were free from bacteria, in the other four one eye. Bacilli were most frequently met with in the discharge of healthy conjunctivæ. Of the 85 conjunctivæ examined, 49 were normal, in 39 bacilli were found, in 9 bacilli and cocci, 6 were free from micro-organisms, in 36, which were pathological, bacilli were found in all, and in 20 bacilli and cocci. Cocci alone were not met with in any case. To meet the objection that the almost constant presence of bacilli might be a peculiarity of the beneficiaries of the Julius Hospital, Fick also examined 50 healthy conjunctivæ of 26 other persons. In 18 bacteria were found, in the remaining 32, however, nothing. In 15 cases he found bacilli, in 7 bacilli and diplococci, and in 2 tetrades. As regards the micro-organisms in the eyes of the beneficiaries, Fick found 7 varieties of bacilli, the staphylococcus pyogenes aureus, the coccus albus non liquefaciens, the streptococcus and sarcina lutea. They were found both in healthy and diseased conjunctivæ. The number of bacteria found in a conjunctival discharge was very often inversely proportional to the virulence of the disease in question. Micro-organisms may therefore be found both on healthy and diseased conjunctivæ which have no connection with the disease in question and are nothing but parasites. It is necessary to know the latter in order to recognize the true causes of disease. Fick divides the micro-organisms of the conjunctival sac into four groups. The first contains the microbes which produce a specific disease on a healthy conjunctiva. To this group belong the gonococcus and trachoma-coccus. The second contains the micro-organisms which under certain conditions proliferate in the conjunctival sac and produce a disease. The tubercle-bacillus is a good example of this group. The third group contains the micro-organisms which grow both upon the healthy and diseased conjunctiva, but do not give rise to any pathological changes. The prototype of this group is the "air-bacillus" (Luftstäbchen), (identical with Neisser's xerosis-bacillus). The fourth group contains those micro-organisms which do not proliferate in the conjunctival sac, and sooner or later are washed away by the tears. This group is probably represented by the sarcina and leptothrix.

The case of Magnus (342) was that of a boy five hours old, who was born with marked blennorrhœa and secondary affection of the cornea. Three days before birth the membrane burst, so that the micro-organisms in the vagina could enter. Perhaps the finger of the midwife introduced them.

ONODI (343) succeeded in producing blennorrhoic conjunctivitis by inoculating a dog affected with catarrh of the conjunctiva with gonorrhoic pus. The healthy conjunctiva, as is well known, is inoculated with great difficulty.

In POMEROY'S (344) case, a single drop of a 2 % solution of nitrate of silver was applied to the conjunctiva of an infant a day old. Hemorrhage set in, which was only finally controlled, and that with difficulty, by means of a compressive bandage applied firmly for 36 hours. There was no bleeding anywhere except from the conjunctiva. BURNETT.

REUSS (345) observed tuberculosis of the conjunctiva in a patient aged 66, who came from a tuberculous family, and suffered himself from the disease. The lid was only slightly swollen. The conjunctiva of the upper lid was covered with round, flat granulations, separated from one another by shallow depressions. In the outer half there was a superficial ulcer with thickened margins, the floor of which was covered with flat granulations. In view of a case in which there was no eruption of vesicles on the conjunctiva, SCHMIDT RIMPLER (346) opposes the assumption that only pemphigus can lead to the so-called essential xerosis of the conjunctiva.

SCHMIDT-RIMPLER (347) observed in a hæmophilous child aged 9 months, a hemorrhage from the conjunctiva of the left upper lid, which could not be permanently stilled, and finally caused the death of the child.

SEREBRENNIKOWA (348) tried in six cases the injections of carbolic acid into the subconjunctival tissue and trachoma follicles as recommended by Dr. Schtschepkin, and convinced himself of the uselessness of this method. HIRSCHMANN.

In view of the seat of pterygium THEOBALD (349) seeks its cause in a connection between the vascularization of the muscle, and the hyperæmia of the conjunctiva.

TILLY (350) reports a case of pemphigus of the conjunctiva which was bilateral, and had resulted in total destruction of sight. The patient was a boy, and when five years old, was vaccinated. Soon after, bullæ made their appearance on various parts of his body, and his eyes became "red as beef." When seen by Tilly the lids were attached to the globes, and the corneæ were dry and horny. No tears or mucus moistened the eyes. The lashes were in normal position. BURNETT.

351. AYRES, S. C. Keratitis bullosa. *Amer. Jour. Ophth.*, 1887, No. 3, p. 64.

352. CROSS. Tumor of cornea. Ophth. Soc. Unit. Kingd., June 9, 1887.

353. FROMONT, H. Du traitement par le feu de certaines affections de la cornée. *Thèse de Paris*, 1887.

354. GUNN, M. Calcareous film of cornea. Ophth. Soc. Unit. Kingd., Jan. 27, 1887.

355. HOTZ, F. C. Hypopyon keratitis treated by frequent irrigations with sublimate. *Amer. Jour. Ophth.*, 1887, No. 6, p. 164.

356. LANG. Fluorescence in both corneæ (?) from deposit of quinine. Ophth. Soc. Unit. Kingd., 1886, p. 151.

357. MACKINLAY. Intense pigmentation of cornea and conjunctiva. Ophth. Soc. Unit. Kingd., 1886, p. 144.

358. MULES. Severe ulcers of cornea. Ophth. Soc. Unit. Kingd., Jan. 27, 1887.

359. NETTLESHIP. Case of primary calcareous film on the cornea, remaining unaltered for nine years. Do. 1886, p. 153.

360. RACHET. Contribution à l'étude de la tuberculose primitive de la cornée. *Thèse de Paris*, 1887.

361. REYNANT, M. Du cautère actuel dans le traitement des ulcères graves de la cornée. Rec. des actes du comité méd. des Bouches-du-Rhone, vol. xxv., 2–3.

362. RAMPOLDI. Contribution alla genesi della ectasia pellucida della cornea. *Ann. di ottalm.*, vol. xii., 2–3, p. 115.

363. STRSCHEMINSKY. Antiseptic treatment of corneal ulcers. *Med. Obosrenije.*, 1887. vol. xxviii., No. 13.

AYRES (351) opened the vesicles in keratitis bullosa, cauterized them with concentrated carbolic acid, and then strewed iodoform upon them, or he used the mitigated nitrate of silver stick. The scar he tattooed if necessary.

HOTZ (355) has tried treating hypopyon-keratitis with frequent irrigations of the eye with sublimate (1 : 5000), and he thinks with good results. BURNETT.

MACKINLAY (357) observed a brownish discoloration of the cornea and conjunctiva in a patient aged 44, who was working in an aniline factory. Vision was slightly impaired, but began to improve when the patient remained away from the factory.

FITZGERALD.

MULES (358) records a case of ulceration of the cornea in a man, the subject of Graves' disease, which was cured by paring and suturing the edges of the lids.

RACHET (360) reports a case of tuberculosis of the cornea in an otherwise apparently healthy girl, aged fifteen. The corneal affection consisted in two indolent ulcers, the tuberculous nature of which was proven by the microscopic examination of particles scraped off, and by inoculations. A cure was affected in three months by scraping them out at times, using eserine and iodoform and improving her general health. MARCKWORT.

RAMPOLDI (362) discusses 24 clinical observations of keratoconus and keratoglobus, and concludes from the microscopic examination of an eye affected with keratoconus that these changes in curvature of the cornea must be sought in an alteration of Descemet's membrane and its epithelium, and that on account of the nutrition of these tissues taking place through the uvea, these changes are dependent on constitutional affections, especially scrofula. DANTONE.

In deep ulcers of the cornea, with or without hypopyon, STRSCHEMINKSY (363) recommends washing out the conjunctival sac several times daily with a sublimate solution (1:3000 to 1:5000), introducing iodol salve (5 % to 12 %) twice daily, instilling eserine and ordering antipyrin or antifebrin internally to alleviate the pain. By following this treatment Strscheminsky has had quick and good results. HIRSCHMANN.

364. MULES. Scleral hernia. Ophth. Soc. Unit. Kingd., Jan. 37, 1887. Report of cases.

365. SNELL, S. Conjunctival suture for scleral wounds. Do., March 10, 1887.

SNELL (365) considers the introduction of sutures into the conjunctiva only sufficient in wounds of the sclera.

Sections XII.–XXI. Reviewed by Dr. NIEDEN.

XII.—IRIS.

366. BRAILEY. Iritis (monocular) in a child; tubercular (?). Ophth. Soc. Unit. Kingd., 1886, p. 167.

367. HUTCHINSON, Jr. The pupil-symptoms met with after injuries to the head. *Ophth. Rev.*, 1887, pp. 129–153.

368. KEYSER, P. D. On operative treatment of posterior synechiæ. Internat. med. Cong. at Washington, Sept. 6, 1887. *Med. Rec.* Keyser advocates detaching them with hooks. Iridectomy

should only be performed when there are central deposits on the capsule.

369. Lawford. Development of pigment-layer on the anterior surface of the iris. Ophth. Soc. Unit. Kingd., 1887, p. 161.

370. Nettleship. New formation of pigment on the anterior surface of the iris. Ophth. Soc. Unit. Kingd., 1887, p. 163.

371. Nys. Du zone sur la membrane de Descemet chez les tuberculeux. *Gaz. des hôp.*, July, 1887, No. 84, p. 688.

Brailey (366) reports an observation of monocular iritis in a girl aged fourteen, of delicate constitution, whose iris was discolored, and on the surface of which numerous small grayish-yellow nodules were visible. There were three extensive posterior adhesions and several small gray opacities in the cornea, with slight pericorneal injection. The glands of the neck were enlarged on both sides, she perspired freely at night, and coughed, but objective symptoms of an affection of the lungs could not be found. The history showed that her grandfather had died of phthisis.

Hutchinson, Jr., (367) discusses the pupillary symptoms after injuries of the head, and believes that unilateral rigid mydriasis indicates with great probability an intracerebral hemorrhage on the same side. Hutchinson, Sen., connects it with a direct pressure on the oculomotor nerve in its course through the middle cranial cavity. In one half of the cases cited by Hutchinson there was a rigid wide pupil only on the side of the hemorrhage. The diagnostic importance of this symptom is considerable, as it is frequently difficult to determine which side of the skull was injured. The speaker thinks that the assumption of a pressure on the corpora quadrigemina explains the phenomena better than that of an affection of the oculomotor nerve. In cases in which the immobility of the pupil was due to a thoracic aneurism or pressure of swollen glands, the pupil of the affected side was contracted, while Hutchinson, Sen., has shown (*Brain*, vol. i., p. 11, etc.), that the ordinary condition is not contraction, but immobility of the pupil. The main points he presents in these sentences: 1. In most cases of concussion of the brain the pupil reacts slowly for a certain time, the length of which depends on the severity of the injury, without either marked myosis or mydriasis. 2. In only a few cases there is mydriasis at times (in one eye or both). 3. In inflammatory symptoms after injuries of the brain myosis is the rule. 4. In pressure due to a meningeal hemorrhage there is generally collateral, monocular mydriasis, then binocular;

very seldom myosis. 5. In injury of the sympathetic nerve within the cranial cavity, there is never true myosis, and the pupil on the injured side does not dilate.

LAWFORD (369) describes a case of new formation of iris-pigment on the surface of the iris in a person on whom an iridectomy had been performed on account of subacute glaucoma. Seven months later the intraocular pressure again increased, and sight was totally destroyed. When the enucleated eye was examined, a layer of pigment, with well defined edges, was found extending from the pupillary margin towards the periphery, of about one fourth the width of the iris, and occupying about one sixth of its circumference. It was directly connected with the uveal pigment of the posterior surface of the iris, but could be more readily detached. In a few sections, in which this anterior layer of pigment had fallen off, it could be seen that the outermost layer of cells of the iris ended abruptly at the point to which the peripheral end of the anterior layer of pigment extended.

NETTLESHIP (370) describes four more cases of new formation of pigment on the surface of the iris. In the discussion which followed Brailey and Juler declared that Lawford's case might have been one of ectropium of the iris.

XIII.—CHOROID.

372. WAGENMANN, AUG. A case of bilateral metastatic ophthalmia in childbed, due to multiple emboli of streptococci. *v. Graefe's Arch. f. Ophth.*, vol xxxiii., 2, p. 147.

WAGENMANN (372) describes a case of bilateral metastatic ophthalmia in childbed in a woman aged thirty-seven, who had had an abortus in the fourth month. The left eye was first attacked. Chemosis of the very highest degree was the characteristic external symptom. The autopsy showed metastasis in the valves of the heart, in the heart itself, and in the kidneys. The anatomical examination revealed a septic-embolic affection of the retina, due to multiple extensive embolisms of the blood-vessels, with streptococci and enormous proliferation of the microbes in the eye. Probably a soft embolus had first been carried into the central retinal artery, when the general infection then took place.

XIV.—GLAUCOMA.

373. BRUGSCH (Cairo). On the predisposition to glaucoma. Internat. med. Congr. at Washington. *Med. Rec.*, Sept. 8, 1887.

374. Leber, Th. Contribution to the history of iridectomy for glaucoma. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 244; polemical correction of the erroneous views of v. Wecker in regard to v. Graefe's position on the theory of increased tension.

375. Mellinger, Carl. Two cases of iridectomy in hydrophthalmus congenitus with good result. *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxx., p. 345.

376. Stölting. Glaucoma after linear extraction. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 177.

Brugsch (373) has also found in Egypt a preponderance for the Semitic race in the occurrence of glaucoma, in 4 % of all cases, against 1 % among other races. Whether eyes with a small cornea, as in the case with Egyptians, are more liable to attacks of glaucoma, has not, as yet, been decided. In regard to its cause, he seeks it, in the majority of cases, in the retention of the normal secretion.

Mellinger (375) reports on two cases of iridectomy, with good result, in congenital hydrophthalmus occurring in two children of two and five years respectively, performed in both on the left eye under chloroform and cocaine. A broad coloboma was obtained. The diameter of the corneæ decreased perceptibly.

Stölting (376) contributes an observation of glaucoma after linear extraction, the literature of which subject is, as yet, very meagre. The operation was done on a person aged sixty-four, and, although he operated six different times in various ways, he failed to reduce the intraocular pressure, and finally had to enucleate the eye. The results of the macro- and microscopic examination of the eyeball induce him to assume that, in this case, the glaucoma was due to incarceration of the capsule of the lens in the corneal scar, the ciliary body being dragged forward thereby. From this inflammatory changes in the choroid resulted, occlusion of the lymph ducts and venae vorticosæ, engorgement of lymph in the suprachoroidal space, and pressure upon the vitreous. The latter pushed the iris against the sclero-corneal margin, and caused secondary adhesion at this point.

XV.—SYMPATHETIC OPHTHALMIA.

377. Coleman, W. F. Sympathetic ophthalmia. *Journ. Amer. Med. Assoc.*, Sept. 24, 1887.

378. Hotz, F. C. Three cases of sympathetic ophthalmia,

arrested by an early enucleation of the injured eye. *Journ. Amer. Med. Assoc.*, Aug. 13, 1887.

379. GIFFORD, H. Contributions to sympathetic ophthalmia. Internat. med. Cong. at Washington. *Med. Rec.*, Sept. 8, 1887.

380. MULES, P. H. Evisceration and artificial vitreous. Do. In the discussion the danger of sympathetic ophthalmia from this operation is set forth.

COLEMAN (377) presents the history, in greater or less detail, of twenty-eight cases of sympathetic ophthalmia, giving the form of injury or disease in the eye first affected, the condition of the eye, the interval between the injury or disease in the first eye and that of the sympathizing eye, and the condition of the second eye. He believes that the enucleation of the offending eye during active sympathetic inflammation of the fellow to be good surgery. BURNETT.

HOTZ'S (378) three cases are as follows: Case I.—Fragment of steel in the fundus of the left eye; sympathetic optic neuritis of the right eye; enucleation; recovery of right eye. Case II.—Extensive laceration of the eyeball by a piece of glass; secondary subchoroidal hemorrhage by a blow; incipient optic neuritis; enucleation; recovery. Case III.—Laceration of the left eye; neuro-retinitis and diffuse choroiditis, with cloudiness of the vitreous of the right eye; enucleation; recovery. BURNETT.

GIFFORD (379) has made experiments as to the manner in which india-ink and anthrax bacilli, injected into the posterior part of the eye, are transported, and has found that, even after the path through the optic nerve has been cut off by neurectomy, the india-ink is found in the brain. There must, therefore, be other lymph paths leading from the eye to the brain besides those in the optic nerve.

XVI.—LENS.

381. CHISOLM, J. J. The after-treatment of cataract cases to the exclusion of compresses, bandages, dark-rooms, and restraint. *Journ. Amer. Med. Assoc.*, July 9, 1887.

382. DEUTSCHMANN, R. Pathologico-anatomical examinations of the eyes of some diabetic persons, with remarks on the pathology of diabetic cataract. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 229.

383. DUJARDIN. Cataracte hémorrhagique. *Journ. des sci. méd. de Lille*, No. 51, p. 73, July, 1887.

384. Kipp, Ch. J. A case of spontaneous absorption of a senile cataract, without injury to the capsule of the lens; restoration of excellent vision. *Amer. Journ. Ophth.*, June, 1887.

385. Möbius, O. On Förster's iridectomia maturans for the artificial ripening of immature cataracts. Inaug. Diss., Kiel, 1887.

386. Mooren, A. On the simplest method of cataract extraction. Internat. med. Congr. at Washington. *Med. Rec.*, Sept. 6, 1887.

387. Schlösser, Karl. Experimental studies on traumatic cataract. With six plates. Munich, 1887.

388. Stölting. Glaucoma after cataract extraction. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 188. Cfr. Rev. No. 376.

389. v. Wecker. On cataract extraction. Polemics against Logetschnikow. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 291.

Chisolm (381), in addition to leaving off bandages, now allows the patient the use of the other eye from the time of the operation, and does not insist upon the patient going to bed.

Burnett.

Deutschmann (382) describes the microscopic appearance of four eyeballs taken from diabetic persons, three of whom, curiously enough, were only twenty-five years old. He, too, like Kamocki (cfr. Rev. No. 199, Ger. ed.), found the œdematous swelling of the pigment layer of the posterior surface of the iris as a characteristic symptom; also large leucocytes containing myeline scattered through the lens; these leucocytes absorbed the substance of the broken up lens-fibres.

Dujardin (383) reports an extraction in which during the operation hemorrhage into the vitreous took place; the lens was extracted with a spoon. A firm bandage was applied, which was soon soaked with blood, and when it was removed six days later, the wound still gaped. The final result was atrophy of the eyeball.

Marckwort.

Kipp (384) extracted a ripe cataract from the left eye of a man fifty-five years old, in 1873. The right lens was then nearly opaque. In 1885 it was found that the lens in the right eye had been absorbed, leaving a nearly perfectly clear capsule and good vision. No sufficient traumatism was remembered, nor was there there any discernible rent in the capsule.

Burnett.

Möbius (385) reports that in the ophthalmic clinic at Kiel Förster's ripening operation has been performed in twenty cases. In seventeen the result was satisfactory; in three iritis followed.

Mooren (386) describes his simplified method of cataract extraction, performed with the aid of the speculum, Graefe's knife, and fixation forceps. The section is made downwards. He practises extraction combined with iridectomy upward only in marked arterio-sclerosis.

Schlösser (387) presents a very careful study on traumatic cataract, the details of which cannot be discussed here on account of want of space. The paper is worthy of careful study.

Wecker (389) defends his method of cataract extraction, consisting in (1) removal of the anterior capsule ; (2) irrigation of the sac and anterior chamber ; (3) instillation of eserine into the anterior chamber, of course always without an iridectomy. The number of prolapses has only increased two-thirds per cent. since he adopted this method.

XVII.—VITREOUS.

390. Königstein. Case of synchisis scintillans. *Deutsche med. Ztg.* 1887, No. 51. Report of a case with examination of the eye. Cholesterine and tyrosine could not be found either chemically or microscopically.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

391. Borel. Des amblyopies toxiques. *Bull. méd.*, 1887, No. 54, p. 858.

392. Galezowski. On the curability of detachment of the retina. Internat. med. Cong. at Washington. *Med. Rec.*, Sept. 8, 1887.

393. v. Grolmann. Contribution to the knowledge of glioma of the retina. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 47.

394. Nordenson, Erik. Detachment of the retina. Investigations into its pathological anatomy and pathogeny. With a preface by Prof. Leber. With twenty-seven lithographic plates. Wiesbaden, 1887. J. F. Bergmann.

395. Ole Bull (Christiania). Pathological changes in the walls of the blood-vessels of the retina. Internat. med. Congr. at Washington, Sept. 5, 1887.

396. Sinclair, A. G. A case of glioma affecting both eyes. Internat. med. Congr. at Washington. *Med. Rec.*, Sept. 8, 1887.

397. Ulrich, Rich. On retinal hemorrhages in anæmia, and the intraocular pressure in loss of blood, in poisoning with

quinine and chloral. *v. Graefe's Arch. f. Ophth.*, vol. xxxiii., 2, p. 1.

Borel (391) publishes an interesting paper on amblyopia. He calls particular attention to the fact that tobacco- and alcohol-amblyopia are cured simply by abstinence. In opposition to Hirschberg, he considers it impossible to make a differential diagnosis between alcohol- and tobacco-amblyopia, as he failed to find the differential symptoms mentioned by Hirschberg. Near vision is more impaired than distant vision, and as convex glasses do not sufficiently improve the former, the cause of this disturbance in the relation of near to distant vision cannot be attributed solely to paralysis of accommodation. (I have had numerous opportunities to observe cases of alcohol- and tobacco-amblyopia, and can confirm the above in all respects. I would also add that smoking the short, straight pipes used in Belgium and France, and chewing tobacco are most frequently followed by amblyopia. I, too, think that injections of strychnine, etc., are entirely unnecessary, as the same result is obtained by simple abstinence.—Rev.)

MARCKWORT.

Galezowski (392) found detachment of the retina in 0.52 % of all his cases (789 cases of detachment) 11 % of which occurred in both eyes, and 24.6 % of which were of traumatic origin, while in eighteen cases syphilis, and in four sympathetic ophthalmia, was apparently the cause. Choroiditis and liquefaction of the vitreous predispose. Rupture of the retina occurs, but is not the rule, and probably is only a result of the detachment. As regards treatment, he obtained a complete cure in seven cases with antiphlogistics, rest, etc., while iodide of potassium and inunction are indicated where there is an exudation or constitutional disease. He also recommends suction of the subretinal liquid with a modified Pravaz syringe through the sclera, with the aid of which he cured two cases among seventeen, while in all cases an improvement at least may be obtained.

v. Grolmann (393) reports an interesting case of binocular glioma retinal endophytum in a child two years old, which was observed at the Giessen ophthalmic clinic. The disease did not attack the other eye until four years after the enucleation of the first, and appeared under the picture of a disintegrating metastasis of the vitreous. Perhaps this phenomenon was ascribable to the mercurial treatment. Vision, which had been $\frac{20}{200}$, rose to $\frac{20}{30}$, but rapidly failed again when the tumor began to grow fast, until the eyeball ruptured and the child died, after about nine months under cerebral symptoms. Although, therefore, no relapse may occur in the orbit of the enucleated eye, the other eye may be attacked after a long series of years. The prognosis depends greatly on the age of the patient. The autopsy showed that the tumor took its origin from several layers of the retina, while the outer granular layer may also participate.

NORDENSON'S (394) paper, excellent both in contents and appearance, is based on the examination of four globes with spontaneous detachment of the retina and one with detachment in albuminuric retinitis. The former all presented the same condition, shrinkage and partial detachment of the vitreous, detachment and rupture of the retina, and finally chronic choroidal affections. Nordenson considers the latter the primary condition, followed secondarily by the other changes, especially by the rupture, which precedes the detachment (Leber). He adds a clinical review of 126 cases of spontaneous detachment of the retina in 117 patients of the Göttingen ophthalmic clinic, in 46 of which, = 38.6 %, a rupture could be demonstrated. For details see the original.

SINCLAIR (396) found that a child, both of whose eyes he had been obliged to remove on account of glioma of the retina, was still in good health six years later. The anatomical examination had revealed the existence of gliosarcoma beyond a doubt.

ULRICH (397) observed a peculiar ophthalmoscopic condition at the papilla after great loss of blood. With the exception of a communication by Horner, no other observations of this kind have been reported. The condition consisted in a discoloration of the veins on the papilla, accompanied with retinal hemorrhages. Beyond the papilla the veins were dark, tortuous, and wider, the arteries thin and bordered with bright streaks ; on the papilla the veins were of a bright-red color, as though they had been converted into arteries. This phenomenon is undoubtedly due to an imperfect filling of the blood-vessels in consequence of the diminished pressure, combined with an obstruction in circulation in the central vein at the point where it dips down, to the increase of this obstruction by the action of the intraocular pressure, and to an abnormal transparency of the blood. He also reports the results of his investigations as to the intraocular pressure in chloral poisoning in animals, which prove that under these conditions the intraocular pressure is diminished.

XIX.—OPTIC NERVE.

398. EDMUNDS and LAWFORD. Optic neuritis. *Ophth. Rev.*, 1887, p. 134.

399. Manz. On deformity of the skull and affections of the optic nerve. Report of the Heidelberg Ophth. Soc., 1887, p. 18, *Arch. f. Augenhk.*, vol. xviii., p. 195.

400. Sachs, Th. Anatomico-clinical contribution to the knowledge of central scotoma in affections of the optic nerve. *Arch. f. Augenhk.*, vol. xviii., 1.

401. Zellweger, J. Anatomical and experimental studies on the connection between intracranial affections and diseases of the optic nerve. Inaug. Diss., Zurich, 1887.

Edmunds and Lawford (398) criticise the views of Deutschmann on the development of optic neuritis, and from their experience are inclined to attribute greater probability to the theory of descending perineuritis and neuritis than to that of Deutschmann. As regards the assertion that the position of the tumor has no effect on occurrence of papillitis, they found from an analysis of 96 cases of cerebral tumor ending fatally, that in 86 % it was complicated with optic neuritis when the neoplasm was situated at the base or in the cerebellum, while in tumors of the convexity the complication with neuritis was observed in only 46 %.

Zellweger (401) describes two cases of neuritis in cerebral affections in which the autopsy was made. One was a case of basilar meningitis with descending neuritis and marked dropsy of the sheaths of the optic nerve. The other was a case of sarcoma of the parietal lobe, also with dropsy of the sheaths of the optic nerve. From the circumstance that in the first case the meningitis had not developed at all in the region of the pons and medulla oblongata, and only very slightly in the fossa Sylvii, and that in the second case there were no traces of meningitis either at the base or the convexity of the brain, the author concludes that Deutschmann's theory alone, of the connection between intracranial affection and choked disc, can explain the condition found.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

402. Fulton, J. F. A case of almost complete self-enucleation of both eyeballs. *Amer. Jour. Ophth.*, July, 1887.

403. Krüger. Case of foreign body (chip of steel) healed into the papilla. Report of the Heidelberg Ophth. Soc., 1887, p. 180. $V = \frac{1}{10}$.

404. Post, M. H. Rupture of the optic nerve at the chiasma. *Amer. Jour. Ophth.*, June, 1887.

405. Rampoldi e Faravelli. Sul ripianto sperimentale dell'

occhio e su un caso clinico di fortunata riposizione nell' orbita d' un bulbo visivo strappato. *Ann. di Ottalm.*, vol. xvi., 2–3, p. 183.

406. SULLIVAN, M. B. Complete dislocation of the eyeball. *Med. Rec.*, Aug. 27, 1887.

407. ZEHENDER, W. A magnet-operation. *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 317.

408. ZEHENDER, W. A case of echinococcus in the orbit, with remarks on the occurrence of the disease in Mecklenburg. *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxv., p. 333. ; cfr. Rev. No. 357, Ger. ed.

FULTON'S (402) case was that of a man who in a debauch forced both eyes from their sockets by means of his thumbs. A few snips of the scissors sufficed to remove them entirely.

BURNETT.

In POST'S (404) case a colored boy was struck violently on the lower orbital ridge, breaking the bone, lacerating the lid, and dislocating the eyeball. The globe was separated from its connections and a gentle traction brought it away, with more than two inches of the optic nerve attached, the nerve-trunk having been ruptured near the chiasma. BURNETT.

RAMPOLDI'S (405) experiments on healing in enucleated rabbits'- and frogs'-eyes all failed. FARAVELLI, however, reports the successful reposition and healing-in of a boy's eye which had been almost entirely torn from the orbit by the horn of an ox. The uninjured eye hung down on the cheek, and was connected with the orbit only by the external rectus and a part of the fornix. Seven hours after the injury the eye was put back into position, and held in the orbit with two sutures passing through the lids. Only slight irritation attended the healing, and there was no suppuration. After 12 days the eye began to move ; gradually all movements were made, except inwards. The deviation outward was afterwards partly corrected by tenotomy of the external rectus, so that usually the whole cornea remained visible. In the third week the whole corneal epithelium became opaque, and an ulcer formed on one side, but no perforation took place. A small leucoma developed, but the remainder of the cornea cleared up. In the second week the conjunctiva was again sensitive, and soon also the cornea, except the leucomatous portion. The globe remained somewhat soft, the pupil slight dilated, but reacting to atropine and eserine. Of course vision did not return ; when discharged the vitreous was still dull. DANTONE.

Sullivan (406) reports the case of a man who in falling struck his eye on the lid-lifter of a stove. The eye was driven out of the orbit, and the lids closed behind it. The eye was reduced and vision was unimpaired. The dislocation lasted not more than 45 minutes. **Burnett.**

After removing the traumatic cataract **Zehender** (407) extracted a small chip of iron with Fröhling's magnet from the posterior part of the globe. The eye remained soft, and sight was reduced to perception of light.

XXI.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

409. **Borel, G.** Affections hystériques des muscles oculaires (suite). Insuffisance de convergence. *Arch. d'ophth.*, vol. vii., No. 4, p. 356, July–Aug.

410. **Frothingham, G. E.** A case of epilepsy, apparently cured by the correction of hypermetropia and relief of ciliary spasms. *Jour. Amer. Med. Assoc.*, Sept. 3, 1887.

411. **Haltenhoff.** Du vertige paralysant. *Rec. d'ophth.*, 1887, p. 408, and *Progr. méd.*, 1887, No. 26, p. 215.

412. **Hughlings-Jackson.** Ophthalmology and diseases of the nervous system. Trans. Ophth. Soc. Unit. Kingd., 1886, vol. vi., p. 1.

413. **Mooren, A.** On eye-diseases and their connection with affections of the occipital lobe. Internat. med. Congr. at Washington. *Med. Rec.*, Sept. 5, 1887.

414. **Roorda Smit, J. A.** De cholera in Cordeba. *Weekblad van het Nederlandsch Tijdschrift van geneeskunde*, 1887, Deel ii., p. 672.

415. **Valude.** On tuberculosis of the eye. Report of the Ophth. Soc., at Heidelberg, 1887, p. 66.

Borel (409) reports at length on a case of insufficiency of the internal recti in a hysterical woman observed at Landolt's clinic. The tenotomy of one of the external recti had only a transitory effect, but advancement of one of the interni gradually effected a cure. The author endeavored to produce artificially in the hypnotic condition in three hystero-epileptic women of Charcot's clinic the muscular disturbances observed in hysterical persons. In the cataleptic condition he succeeded for a very short time in producing divergent strabismus by rotating an eye outward while under the influence of cocaine. The muscles of the eye, like those of the face, did not seem therefore to maintain the position given them during the cataleptic state. In the lethargic state, in which the muscles are particularly excitable, the touch of a muscle through the lid is enough to cause a contraction. The other eye remains quiet or makes an associate movement. The latter the author ascribes, not to an idiomuscular, but to a cerebral process of irritation. In the somnambulistic state the author could produce ptosis with convergent strabismus at will, when he made the patients believe that their eye was closing and that they could not open it, or that they squinted. When the patient awoke the deviation remained, and tests for double vision could be made. In conclusion the author reports a case of transfer of squint from one person to another with the magnet: A patient in the cataleptic state was placed in the position of a prize-fighter; her face at once assumed a threatening expression and her eyes looked steadily to the left. A magnet was placed between her and another patient behind a screen, whereupon this patient also gradually assumed the same position as the former, though neither was aware of the presence of the other and not a word was spoken. [(!) Rev.] V. MITTELSTÄDT.

HALTENHOFF (411) describes under the name of vertige paralysant a peculiar disease which manifests itself periodically in form of dizziness, pain in the neck radiating into the shoulders, paresis, especially of the extensors, and ptosis. Consciousness is not lost during the attacks, which last about 10 minutes. At first they occur only in the afternoon, but as the disease progresses, also in the forenoon; when improvement began to take place, not the number, but the intensity of the attacks decreased. The disease has been observed only in farmers, appearing epidemically on individual estates. It begins in midsummer and ends in winter. MARCKWORT.

HUGHLINGS-JACKSON (412) treats in his paper of the relation of ophthalmology to diseases of the nervous system, and thinks that by a rational division of labor and strict investigation of the two subjects results can be accomplished which would increase our general scientific knowledge.

Taking for a basis Munk's experiments on the visual centre in the occipital lobe MOOREN (413) reports on 42 cases, in 19 of which he observed left-sided, in 14 right-sided, in 5 nasal, and in 4 temporal hemianopsia. He also adopts the well-known theory of Wilbrand as to the location of the different visual centres (perception of color, form, and light).

In FROTHINGHAM'S (410) case the epilepsy had existed since the eleventh year and she was then 24. All manner of remedies and many eminent physicians were tried without effect. A manifest H of 0.75 was found and a total H of 2 D under atropine. Atropinization was kept up for some time, and correcting glasses were ordered with the result of a complete cessation of the spasms. The cure has lasted two years. BURNETT.

J. A. ROORDA SMIT (414) saw complete blindness from atrophy of the optic nerves develop within two weeks in a previously healthy man who was attacked with cholera. The pupils were of medium size, immovable, the media clear, retina and blood-vessels normal, the papillæ in both eyes shining white. The other visual organs and the reflexes normal. Treatment did not benefit him. WESTHOFF.

On the basis of extensive experiments as to the transmission of tuberculous matter into the different membranes of the eye, especially the conjunctiva, uveal tract, and lachrymal gland, VALUDE (415) comes to the conclusion that the tuberculous poison does not easily produce an infection in the territory of the tears, as it does not adhere at all or only imperfectly to the lachrymal gland or the surface of the conjunctiva, while the inoculation of the conjunctival and irido-choroidal tissue is always followed by a positive result. Perhaps the chemical composition of the tears also checks the development of the tubercles, while the numerous microbes in the conjunctival sac may destroy the tubercle-bacilli.

MISCELLANEOUS NOTES.

The Seventh International Congress of Ophthalmologists will be held at Heidelberg, Germany, from August 8th to 11th. Tickets of membership can be obtained at the Grand Hotel, Heidelberg, August 7th, on and after 8 A.M. Price, mk. 16. A fourth subject for discussion has been added to the three previously announced (see these ARCH., vol. xvi., p. 127). It is : "The Causes and Treatment of Strabismus," introduced by Landolt (Paris) and Reymond (Turin). The attendance promises to be larger than ever, and the papers and discussions of unusual importance. Socially the meeting will surely be no less enjoyable than any previous one.

On May 27th of this year, Dr. F. C. DONDERS, in Utrecht, reached the age of seventy years, when, according to the law, he had to resign as professor at the university. A committee had been constituted long before for the purpose of collecting a fund to be given to him at the above-mentioned date, leaving the application of it to his discretion. The sum of 34,000 guilden ($13,600) was brought together by pupils, friends, and admirers in nearly every civilized country ; and it was decided by Donders that the interest of this capital shall be used for the education of young physiologists and ophthalmologists.

We hope that although Donders has now retired as teacher from the university, many years may yet be given him so that the medical profession may still profit by the remarkable talents and rich experience of this great man.

A number of VERY VALUABLE PUBLICATIONS have lately appeared, among which we mention :

(1) **Annales du Laboratoire de l'Hospice Nationale des Quinze-Vingts.** Recherches sur l'anatomie et l'histologie, normales et pathologiques, de l'œil, accompagnées d 'un atlas et pub-

liées par Dr. FIEUZAL, médecin en chef, et le Dr. HAENSELL, chef du Laboratoire.

The object of this publication is clear from the title. The first number, in large octavo, is excellent in every respect, the technique of the microtome, and the leuco-sarcoma of the ciliary body, with excellent large wood engravings and four large chromo-lithographic plates, being the chief subjects treated of. Everybody who, like the reviewer, has seen the author at work, Fieuzal at the head of one of the largest clinical establishments of ophthalmology, and Haensell conducting a gem of a laboratory with unsurpassed enthusiasm, skill, and industry, will feel that the publication of their combined work will rank among the most important contributions to the science of ophthalmology, and be a benefit to every practitioner.

(2) **Nordisk Ophthalmologisk Tidsskrift.** Edited by Dr. E. HANSEN GRUT, in conjunction with Drs. J. BJERRUM (Copenhagen), Z. NORDMAN (Helsingfors), HJ. SCHIÖTZ (Christiania), and J. WIDMARK (Stockholm). Copenhagen: Jacob Lund, 1888.

The first (double) number of this new journal is before us with nine original articles (147 pages), and selected abstract, from literature (20 pages). Unfortunately we do not understand the "Nordisk" language, but the well-known names of the editors and contributors guarantee this addition to the periodical ophthalmological literature to be of value. The people of Scandinavian tongue not having had a special organ of ophthalmology, the "Tidsskrift," in the true sense of the word, will fill a want. The field of observation being great, and the workers in it men of knowledge, skill, and talent, the new journal promises to be of importance both to its own and to other countries.

(3) G. HARTRIDGE, F.R.C.S. **The Refraction of the Eye.** Third edition. Churchill (London); P. Blakiston, Son, & Co. (Philadelphia), 1888. 236 pages, profusely illustrated, Price, 5*s.* 6*d.* ($2).

This book, in small octavo, handsomely gotten up, is a clear exposition of a special part of ophthalmology which cannot be mastered without considerable efforts. The little treatise will greatly assist the student.

(4) HY. R. SWANZY, F.R.C.S.I. **A Handbook of the Diseases of the Eye.** Second edition. London: H. K. Lewis, 1888. 454 pp. Small octavo, beautifully printed and illustrated.

The second edition following the first in four years, is brought up to the latest publications, and constitutes for students and general practitioners one of the best text-books that we are acquainted with. Nothing essential seems to be omitted, but the extensive subject-matter is so concisely, clearly, and systematically presented that the moderate size of the book is proof of the author's constant consideration of the reader's time. We recommend it unreservedly.

(5) MAX KNIES. **Grundriss der Augenheilkunde.** Wiesbaden (Bergmann), 1888. One octavo volume of 320 pages and 30 illustrations in the text.

This treatise, like the preceding, is principally designed for the use of students and practitioners. It is nicely gotten up, clearly written, and systematically arranged. The author, well-known by his own investigations, had the advantage of being, for a number of years, chief assistant of O. Becker at Heidelberg and F. Horner at Zurich, whose views and practices are embodied in the book.

(6) Three large monographs which have been reviewed in our systematic reports on the progress of ophthalmology, should here be specially mentioned on account of the high character of the investigations they contain, and also for the superb typography. All published by F. E. Bergmann, Wiesbaden, 1887. They are :

E. NORDENSON. **Investigations on the Pathological Anatomy and Pathogenesis of Detachment of the Retina.** 255 pages of text, large octavo, and 27 excellent plates with explanatory description.

J. STILLING. **Investigations on the Origin of Myopia.** One octavo volume of 216 pages, with 71 figures in the text and 17 lithographic plates.

J. MICHEL. **On the Degeneration and the Decussation of the Optic Nerve.** A folio volume of 91 pages and 4 plates.

These works will be ornaments in the book-cases of oculists, and should be in every public library that has a medical department.

H. K.

OBITUARY.

Dr. **Edward G. Loring** died suddenly in this city on April 23d, at the age of fifty-one years. He was born in Boston in 1837, and after a stay abroad of a number of years, he completed his medical education at the Harvard Medical School. After a brief residence in Baltimore he settled in New York, where he soon gained recognition as one well versed in the science of ophthalmology. He interested himself mainly in the study of the refractive condition of the eye, and many of his publications refer to that subject. The modification of the ophthalmoscope designed by him has been extensively adopted among American oculists, and is well suited for the purpose for which it was devised. His life's work was to be embodied in a text-book on ophthalmoscopy, of which, unfortunately, only the first volume had appeared when death overtook the author; it is to be hoped, however, that from the notes he left behind the work may be completed by other hands. His style was clear and forcible, essential qualities in dealing with the difficulties of this subject, making the perusal of his work a pleasure.

His many good qualities gained for him the respect and admiration of a large circle of friends and the confidence of the community. Ophthalmology has lost in him an earnest and able worker, but his writings will secure for him a worthy position among its exponents.

Dr. **Joseph Aub** died at Cincinnati, in May, of chronic heart disease, at the early age of forty-three. He was a native of that city, and after graduating from the Ohio Medical College, he spent some time abroad in the further pursuit of his studies. On his return to this country he became resident physician to the New York Ophthalmic and Aural Institute, a position he held for three years. In 1872 he took up the practice of his profession in his native city, and by his industry and skill, seconded by the influence of numerous friends, soon rose to a prominent position among his professional brethren. His attainments as an oculist and aurist received wide and general recognition, while his kindness of heart and amiable disposition endeared him to all who came in contact with him. His early death will be widely regretted.

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UNITED STATES ARMY MEDICAL DEPARTMENT

ARCHIVES OF OPHTHALMOLOGY.

GRANULATIONS OF THE CONJUNCTIVA PRODUCED BY LONG-CONTINUED INSTILLATIONS OF COCAINE.

BY WILLIAM C. AYRES, M.D., NEW ORLEANS, LA.

THERE came to my office a short time ago, a lady whose eyes were affected in such a peculiar manner, that I consider a detailed statement of her condition as worthy of note.

CASE.—Miss McM., æt. twenty-five, of Vicksburg, Miss., presented herself on July 5, 1888, with a small dense leucoma of the cornea and anterior synechiæ; $S = \frac{20}{200}$. She explained that she had had a severe attack of eye-disease about a year and a half ago. Her eye was very red and painful at the time, and has been more or less so ever since. She said that every week or so her eye was worse and then got gradually better, all of which could be accounted for by her anterior synechiæ. Her family physician had prescribed cocaine to be dropped into the eye as often as desirable, and she had used it from eight to ten times daily for over a year, and was still using it up to the time I first saw her—viz., July 5th.

On examining the palpebral conjunctiva a very striking picture presented itself. This membrane on the lower lid was slightly thickened and seemed semi-translucent (if I may use such a word) over the whole extent. Scattered over it at intervals of about one half of a *mm* there were small round whitish semi-translucent granules of about one quarter of a *mm* in diameter, and quite hard in consistency. They were not easily movable.

They were thickly studded over the area of the fornix and became slightly less numerous up to within about two *mm* of the margin of the lid. Here they ceased, as did also the thickening of the conjunctiva, allowing the Meibomian glands to be seen, though not so distinctly as in the normal eye.

The conjunctiva of the upper lid was still more densely studded than that of the under lid, and the granules were smaller and more prominent. The same area over the region of the Meibomian glands was free of granules, although the conjunctival tissue was thickened but transparent. The lachrymal canals were entirely closed up by swelling of the tissue immediately surrounding their lumina, and the puncta lachrymalia were protruding, much resembling the condition presented in prolapse of the rectum. We may say that there was a prolapse of these tissues of the canal. A probe could be readily passed into the canal and thence into the lachrymal sac, causing no pain.

The absence of pain in passing the probe through an inflamed swollen tissue was somewhat surprising, therefore after removing the probe from the canal I passed it over the conjunctiva and found the latter perfectly anæsthetic. The leucoma and corneal tissue were only slightly sensitive, and a rough manipulation of them caused but little inconvenience.

The tears had been running over the cheek for several months on account of the closure of the canals, and for the correcting of the closure the probe was passed.

Her lids were treated once daily with cuprum sulphuricum in substance for ten days, during which time there was a marked and rapid improvement of the granulations.

The principal cause of her worry about her eye was the glistening white leucoma—which I proposed to tattoo for her. The first pricking of india ink was done about ten days after her initial visit to the office, and so anæsthetic were the tissues of the eye that it caused no pain at all.

Gradually the eye became more sensitive to the needle-pricking, and pained her very much at night. She had ceased using the cocaine for ten days.

She put in "a few drops" of cocaine, and the granular condition of her conjunctiva returned so rapidly that in one day her eye was almost as bad as it had been in the beginning.

Here I ceased the needle-pricking, and treated the lids with cuprum, when the granulations were quieted down in five days.

Again the pricking was resumed until it became painful and again the lady put in her cocaine, contrary to my instructions, with the same result as recorded above.

Her eyes were dark blue, and the leucoma covered about half the pupil, therefore I let in the ordinary black india ink until the whole leucoma was about the color of her iris. I then traced in my mind about where the pupil would be in the area of the leucoma and made this part of the leucoma very black by a super-supply of black ink. The effect was quite pretty. At a distance of a few feet no defect of the eye was visible.

REMARKS.—This woman had used a strong solution of cocaine (5 %) for over a year, several times daily. It had caused a more or less complete paralysis of the sensory nerves of the conjunctiva and cornea, which did not disappear during the whole time she was under treatment—viz., six weeks.

From the fact that the granular condition of her conjunctiva (only in one eye) rapidly improved under cuprum sulphuricum and cold applications until the granulations were nearly well and then rapidly sprang into prominence again under one night's instillation of cocaine, we are justified in believing the cocaine to be the cause of the granulations. Unfortunately I was not permitted to cut away any of the tissue containing granules for microscopical examination.

INTRAOCULAR HEMORRHAGE AFTER CATARACT EXTRACTION.

By S. E. HILEMAN, M.D., Puebla, Mexico.

Felipa G——, æt. sixty-eight years, large, corpulent Mexican lady, with mature cataract in right eye, of five years' duration, with good indications for operation. Also cataract in left eye, but not quite mature.

Assisted by Dr. Enrique M. Rueda, I operated the right eye June 21, 1888. The patient was operated on the bed that she was to occupy afterward, as is my custom in private practice, and especially when the operation is done without iridectomy.

The operation was very smoothly made, with cocaine as the anæsthetic, without iridectomy, and the cataract extracted without loss of vitreous, leaving a clear, round, and central pupil. The patient was perfectly quiet, scarcely moving a muscle all through the operation. About five minutes later, while awaiting the action of the eserine solution to contract the pupil, before applying the bandage, the patient complained of pain in the right temple and of nausea, both of which passed away in a few seconds. But immediately afterwards the vitreous commenced escaping slowly through the wound in a liquid state. I immediately proceeded to bandage the eye, but before I could do so a great part of the vitreous had escaped, also a few drops of blood. I applied a flannel roller, with absorbent cotton padding, rather tightly, after which the patient felt perfectly comfortable.

In a short while, however, she had nausea again, which soon passed without vomiting. I then took leave of the patient, with instructions to the nurse to notify me in case of accident of any kind, being fully aware that I had one of the exceedingly rare disastrous cases of intraocular hemorrhage to deal with.

I did not see the patient again until next morning, when I learned that she had had vomiting about four hours after the operation, which was repeated five times at intervals of about half an hour. I found the bandage and padding entirely saturated with blood, and upon its removal I found the globe filled with blood, which was slowly oozing out of the wound. I discovered no vitreous, but was satisfied that it had all escaped. Slight hemorrhage continued for six days, after which atrophy of the globe ensued, with a tardy and painful healing.

There was nothing in the appearance of my patient to cause one to suspect such a result of the operation. The patient had neither heart nor kidney disease. She had had, however, several attacks of articular rheumatism, and was complaining of a little pain in the left leg at the time of the operation. But I did not consider it a contra-indication to an operation.

The hemorrhage undoubtedly came from the vessels of the choroid, the walls of which were weakened by sclerosis, probably caused by the attacks of rheumatism or by a recent attack of choroiditis. As soon as the tension of the eye was lessened by the extraction of the lens, the diseased and weakened walls of the vessels were ruptured, with the above sad result.

PERSISTENT HYALOID ARTERY.

By C. W. TANGEMAN, M.D.,

ASSISTANT TO THE CHAIR OF OPHTHALMOLOGY AT THE MEDICAL COLLEGE OF OHIO.

THE function of the arteria capsularis, the manner of its development, and usual disappearance prior to birth, is of extreme interest to the physiologist. A careful study of the embryological development of the eye as we understand it to-day, accounts for many of the peculiar freaks that were formerly simply called congenital. Such cases as coloboma of the iris, choroid, optic nerve, or persistent hyaloid artery, are of interest to the oculist, and are just as thoroughly understood as the surgeon understands in what manner hare-lip or cleft palate are brought about.

No other organ of the human body has received such careful and persistent investigation; no other organ can offer to the anatomist such striking changes succeeding each other in so short a space of time as the eye. Just what day or hour the eye can first be recognized in the human embryo cannot be said, since it is so exceedingly difficult to obtain any number of specimens in condition for investigation at this early stage. It suffices to say in this connection that the eye is one of the earliest organs to appear in the embryo. The crystalline lens begins to form early from an involution of epiblast. It lies in the optic cup, completely isolated as we find it later, just in front of the space to be occupied in the vitreous. It appears to get its nutrition by absorption up to this time.

The walls of the cup grow rapidly all around except that portion which is opposite the middle of the cup. In the natural position of the eye this spot is on its under surface, and by not growing, there is a gap left, which is called the choroidal fissure. This fissure extends back into the optic stalk, and through its opening the mesoblastic structure gets into the interior of the eyeball, from which the capsule of the lens and the vitreous humor are formed as well as the blood-vessels. It is known to every one that the arteria centralis retina lies in the interior of the optic nerve, finding its way into the latter by the optic stalk closing around this branch of the ophthalmic artery during the early embryonic development. At an early stage the lens, as we described it above, is surrounded by a capsule which becomes vascular. The posterior surface of this capsule is supplied with blood from branches from the arteria hyaloidea, which gets into the interior of the eye in the same manner as is described above for the central artery of the retina. This small vessel (which is never accompanied by a vein) runs through the centre of the eyeball forward and as soon as it reaches the posterior surface of the lens it divides dichotomously. The small branches pass around the margin of the lens so as to gain its anterior surface, where they supply the anterior capsule and the membrana pupillaris with blood. In the human fœtus at birth these structures have disappeared; they seem to have been necessary for the development of the lens but are not requisite for its later maintenance. The membrana pupillaris disappears early, as a rule, by absorption, but occasionally cases are observed in which a portion of the membrana or of the hyaloid artery persists at birth and remains so during life. Cases have been reported where the pupillary membrana remains intact, but it is counted one of the greatest rarities to find this membrane to contain vessels. The hyaloid artery is seen sometimes in its entire length, but more frequently as a small shrivelled thread still adherent at its origin.

There is another class of cases where vessels carrying blood are found in the interior of the eyeball. Small branches are given off from the retinal vessels, but these formations are always found to be connected with some pathological process. V. Ammon[1] gives a representation of this condition in his atlas. Recently more light has been thrown on this subject. Weber[2] produces small vessels carrying blood in the vitreous, experimentally, by a process of irritation. Schweigger[3] shows the presence of vessels in the eye as a pathological process. Coccius,[4] as early as 1859, reports an exceedingly interesting case where the vessels took origin from the retina; the vitreous remained sufficiently clear to permit a very satisfactory study of the whole process. It is certainly difficult to say how the vessel walls are formed, and how they make connection with the retinal vessels. While these cases are an anatomical curiosity and exceedingly rare, they must not be confounded with the condition above described, where a portion or all of the embryonic arrangement of vessels for the nutrition and development of the lens and the anterior portion of the eyeball fail to disappear at the proper time. Everbusch[5] observed a case where the embryonal remains seem to indicate that originally there are two systems of vessels in the vitreous, one reaching toward the retina and the other surrounding the lens. Everbusch suggests that many of the cases reported as persistent hyaloid artery are in reality only a haziness of the canal of Cloquet, which occurs on account of irritation. Czermak[6] presents a case where a small vessel leaves the optic papilla, runs directly forward through the vitreous to about its centre, and then returns, spirally winding around its own axis. This small vascular loop showed distinct pulsations, rising and sinking with each systole and diastole of the heart. It is of great importance that a correct diagnosis is made in these cases. Vassaux[7] gives an instance where an eyeball had to be enucleated on account of a persistent hyaloid artery, and when the eyeball was later examined it was found to contain a gliosarcoma which, in its growth, had drawn some few blood-vessels forward, giving to them the appearance of persistent hyaloid artery.

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[1] "Krankheiten des Menschenauges."
[2] *Virch. Arch.*, vol. xvi., p. 410.
[3] ARCH. OF OPHTHAL., vol. ii.
[4] "Ueber Glaucom," etc., Leipzig, 1859.
[5] "Beitr. zur Embryologie," München, 1882.
[6] *Centralbl. f. prakt. Augenheilkunde.*
[7] "Persistance de l'artère hyaloïde," *Arch. d'ophthal.*, vol. iii., p. 502.

In the case reported by Hirschberg[1] there can be scarcely any doubt but that the vessel formation as observed was due to a pathological process, since the patient was suffering with retinitis punctata in the other eye. The same condition is observed by Ulrich,[2] where, in a typical case of retinitis pigmentosa, the author finds thread-like opacities in the vitreous.

Unterharnscheidt[3] reports a case of persistent hyaloid artery where the remains of the vessel were still attached to the central artery of the retina and the capsule of the lens. The case was under observation for some time when finally the fine strand tore in two, due to an increasing myopia, leaving two small ends floating in the vitreous. W. S. Little[4] reported a very peculiar case where he discovered with the ophthalmoscope a vessel leaving the central artery, running forward into the vitreous, turning upon itself, and after reaching the fundus again dividing into three or four small branches, which are finally distributed over the retina.

The vessel had a red appearance, and seemed to carry arterial blood. The remainder of the fundus was normal. Vision was very much reduced, due to amblyopia from disuse, the patient being under treatment for convergent squint. L. later reported another similar case, but the artery here was attached to the posterior surface of the lens, contained no blood, and disturbed vision but little. (Of all the cases reported where blood was found in the vessel, it came from the region of the papilla.)

Schapringer observed[5] in a child a small artery leaving the papilla and extending into the vitreous, where, turning upon itself, it returned to the starting-point. A number of similar cases have been observed from time to time. In a case reported by Galezowski[6] there were two vessels, a vein and an artery. A rupture of one of these vessels caused a hemorrhage into the vitreous. Kipp[1] and Liebreich[2] rightly maintain that a vein accompanying the hyaloid artery does not exist.

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[1] *Centralbl. f. Augenheilkunde.*

[2] *Klin. Monatsbl. f. Augenheilk.*, vol. xxi., p. 140.

[3] *Klin. Monatsbl. f. Augenheilk.*, vol. xx., p. 449.

[4] "*Transactions Amer. Ophthal. Soc.*," 1881.

[5] ARCH. OF OPTH., vol. iii.

[6] *Recueil d'ophth.*, 1883.

It has been claimed that congenital posterior polar cataract is caused by an improper or incomplete resorption of the lenticular capsule and the remains of the hyaloid system. W. W. Seely[3] reports a case where vision was reduced to $\frac{20}{100}$, and on examination of the eye a dark thread-like body attached to the posterior capsule of the lens was discovered. It performed vermicular movements whenever the eyeball was moved. The papilla was normal in appearance. This seems to be the only case on record where the remains of the hyaloid artery were attached to the posterior surface of the lens. As a rule, these embryonic remains are observed in one eye only. I have found but one case recorded[4] where a distinct vessel having all the appearances of carrying blood was found running from the optic papilla to the posterior pole of the lens in one eye, while in the other the same arrangement existed, but the artery seemed shrivelled. It carried no blood.

I had an opportunity of observing a case of exceeding interest at Professor Seely's clinic, where the patient, a Russian refugee, presented himself for the relief of a granular conjunctivitis of both eyes. The majority of these cases are thoroughly tested as to the refractive condition both with the ophthalmoscope and test lenses. In the examination with the ophthalmoscope I saw a peculiar picture. The fundus with the entrance of the central artery and its distribution was distinctly visible, while one large vessel passed forward through the vitreous to the region of the posterior surface of the lens. The vessel at this point divided regularly, formed quite a network, and finally passed to the ciliary region, just posterior to the iris. Vision was reduced to $\frac{20}{100}$, and was not improved by glasses. The lens was perfectly clear, the pupil movable, but the patient complained of a distinct blurring which he had always noticed in the right eye as long as he can remember any thing. The left eye was normal in every respect. This case is of special interest, since it presented the vessels almost exactly as they are distributed during the development of the eyeball, yet the capsule and lens were absolutely clear. The vessels were not mere threads or fibres, but presented a distinctly red appearance. The patient, residing only temporarily at Cincinnati, was kept under observation only a few days.

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[1] K's Arch. Ophth., vol. iii.
[2] *Trans. Pathol. Society of London.*
[3] *Trans. Amer. Ophthal.* 1882.
[4] Riebau: *Charité Annal.* i., p. 648.

The literature on this subject records but comparatively few cases where the persisting or embryonic vessels in the vitreous continue to carry blood, while but a single case is known to me where the arrangement of the vessels was somewhat similar, viz., that of Hirschberg. In that instance some critics claim the vessels were new formations, instead of embryonic remains, on account of the existence of retinitis in the other eye.

In the author's mind there is little doubt that the criticism in Hirschberg's case is unjust, and was made on account of its exceeding rarity. The impression made on the observer when he first sees such a case is one of doubt until he has studied it carefully; he hesitates in making a diagnosis, as he rarely sees such a picture. It has been claimed by competent writers[1] that the hyaloid artery has an accompanying vein. Upon a careful investigation of the subject and the cases reported, we are firmly led to believe that there is no hyaloid vein, nor does there seem to be any necessity for one. The branches of the artery inosculate with small vessels coming from the ciliary processes and the iris, and in this manner the blood escapes without the intervention of a system of veins, as is the arrangement in all other organs. Vision in these patients as a class is much reduced, and in the majority of cases reported, myopia of a high degree was found.

Those who may have the good fortune to examine such an eyeball *post mortem* as reported by Hirschberg, or as seen by the writer, might contribute some valuable information to the subject of the development of the eye. Aside from the rarity of these cases that would be the only interest connected with them.

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[1] *Recueil d'ophthal.*, 1883.

A CONTRIBUTION TO THE PATHOLOGY OF ALBUMINURIC RETINITIS.

By Dr. JOHN E. WEEKS, New York.

THE following article is based on the histological examination of six globes removed from as many different individuals who suffer from or have died with disease of the kidneys. A short résumé of our present knowledge of the subject is added. Each case showed retinal changes on examination with the ophthalmoscope. One of the cases examined is unique, in that it is one of monocular, hemorrhagic, albuminuric retinitis, in which secondary glaucoma followed, necessitating the removal of the globe. The fellow eye remains good up to the present time, more than a year and a half after the first observation. All of the globes were hardened in Müller's fluid, and embedded in celloidin. Sections were then made, stained and examined.

Case 1.— C. M., forty years, male. In August of 1884 patient noticed swelling of feet and legs, became weak, and experienced pain in head and back, making it difficult for him to continue his labor. In September of 1886 patient was admitted to St. Francis Hospital, Jersey City, where he was treated for Bright's disease. Left the hospital and resumed work after four weeks' treatment. C. M. visited the dispensary at the Ophthalmic and Aural Institute, on March 31, 1887, complaining of loss of vision in the right eye. This was noticed about ten days ago on getting up in the morning. Patient thinks that the failure in vision took place during the night; however, the failure was undoubtedly gradual, but was not noticed sooner as the other eye remained normal. Vision has been steadily diminishing ever since; no pain in the eye. *Status praesens.* extremities swollen ; left ventricle of heart hypertrophied ; no murmur ; face puffy ; urine pale, but normal in quantity ; granular and hyaline casts ; one third of albumen in the test-tube after heat and nitric acid. Right eye : Very slight pericorneal injection ; refracting media clear ; many large and small hemorrhages in all parts of the retina ; white glistening patches in the vicinity of the disc and at the macula lutea—not numerous ; disc swollen ; margins hazy ; papillitis of about the second degree ; vision, $\frac{20}{200}$; tension, $-T_1$. Left eye : Nothing abnormal can be positively determined. Vision, $\frac{20}{20}$.

With the exception of an increase in the number of hemorrhages, the right eye remained in the condition above described until about the 15th of May. The patient was then in a general hospital for the better treatment of his kidney disease. He left the hospital in a few days, and I saw him again about the 25th of May. The media were then hazy ; some hemorrhages into the vitreous ; pupil enlarged ; iris sluggish ; anterior chamber shallow ; tension, $+T_1$; pain, more marked at night. A 1 per cent. solution of the sulphate of eserine was instilled into the eye four times daily, with the effect of relieving the pain.

June 3d.—Patient's condition much as when last seen ; some fibrinous exudation in the anterior chamber. $V = \frac{1}{\infty}$.

June 16th.—Tension $= + T_2$; $V=0$. pupil one half maximum dilatation ; eye very painful. Dr. H. Knapp examined the patient, and agreed with me in advising enucleation. The urine still contains large quantities of albumen.

June 25th.—As on June 16th. Left eye normal.

July 1, 1887.—The eye was enucleated by Dr. H. Knapp, to whose kindness I am indebted for the specimen. The wound healed favorably.

Examination of patient September 17, 1888 : Dyspnœa marked ; respirations 28 per min.; pulse 120 ; heart-beat tumultuous and weak ; no valvular murmurs ; apex beat in sixth intercostal space one half inch to the left of nipple (two and a half inches below nipple) ; area of heart dulness enlarged ; spleen slightly enlarged ; liver apparently normal in size ; lungs not affected ; feet slightly swollen about the ankles ; no ascites ; mucous membranes pale ; radial arteries hard ; no headache ; bowels constipated ; urine pale in color, sp. gr. 1,005 ; fatty, hyaline, and epithelial casts ; albumen one third of test tube ; no sugar ; some leucocytes and epithelia. Eye : Pupil reacts well; $V = \frac{20}{30} +$; no change in the fundus; patient wears an artificial eye over the right stump with comfort.

As indicated above, the left ventricle of the heart is greatly hypertrophied.

Macroscopical appearances: Globe slightly enlarged. Cornea hazy. Anterior chamber shallow. Aqueous turbid. Lens transparent. Vitreous nearly normal in its degree of firmness, grayish-white in color, with remnants of hemorrhages plentiful in the posterior portion. A fibrinous exudation covers the retina in the region of the yellow spot. *Marked glaucomatous cupping of the disc.* The iris, ciliary body, choroid, sclerotic, and optic nerve appear to be normal.

Microscopical appearances: Cornea—small blood-vessels ramifying in Bowman's membrane and in the deep layers of the substantia propria near the sclero-corneal junction are present. Otherwise the cornea is normal.

The iris is thicker than normal; it is pressed against the cornea for about 3 *mm* from its origin, the condition so frequently observed in glaucomatous globes, completely obliterating the iris angle. The increase in nuclei is very slight. There are very marked changes in the walls of the arteries, which will be described later. The veins, pigment layer, etc., are little changed. The anterior chamber is filled with a fibrinous exudation which includes a few leucocytes and red blood corpuscles.

The lens appears to be normal.

A network of fibrine is found throughout the vitreous, and here and there are channels, paths of hemorrhages, in which many red blood corpuscles are found. Large, delicate, branching cells are found in the posterior portion, but are not abundant.

As is usually the case in all forms of albuminuria affecting the eye, the retina is the part most profoundly changed.

The membrana limitans interna is thicker than normal and well defined throughout; the pressure of the exudation into the nerve-fibre layer and the swelling of the tissue of the latter give it a wavy appearance. This membrane is ruptured in a few places (Fig. 1, *a*), permitting of hemorrhage from retinal vessels into the vitreous.

The nerve-fibre layer shows marked changes. The nerve fibres are swollen by imbibition and are more or less separated from one another. Although the diameters of the nerve fibres are not perfectly uniform, no marked varicosities as mentioned by other writers are observed. The so-called glia-cells are larger and much more distinct than in the normal retina. A scanty infiltration of leucocytes is noticeable, most plentiful in the vicinity of the vessels. Hemorrhages are very general in this layer. Deposits of colloid (?) material, coagulated albumen, and fat are met with, but are not of frequent occurrence. Fibrine, occurring most frequently in isolated spaces, near the disc and macula lutea is also seen. The arteries show marked changes in their walls, by which their lumen is reduced. The veins are enlarged, and are engorged with red blood corpuscles. Probably all of the hemorrhages take place from the veins or capillaries in a manner hereafter mentioned. The ganglion cells are pressed apart in many places by the presence of the exudation; they are swollen, and show much more

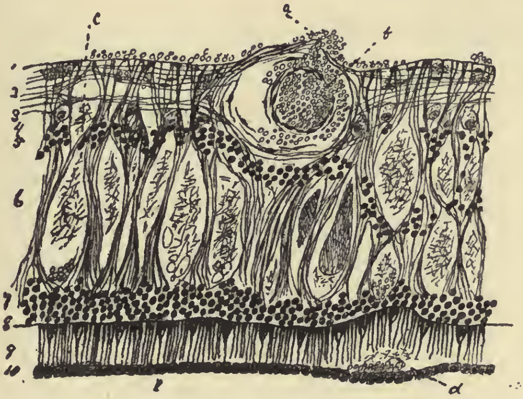

Fig. 1.

RETINAL CHANGES IN CASE NO. 1.

a, rupture of memb. limit. int. and escape of blood corpuscles into vitreous; *b*, rupture in wall of vein; *c*, coagulated exudation, fibrine, blood corpuscles, etc.; *d*, exudation causing separation of ninth and tenth layers of retina; *e*, fat globules.

prominently than in the normal retina. In some parts of the retina the ganglion cells have undergone a granular degenerative change.

Very marked changes appear in the inner granular, inner nuclear, and external granular or internuclear layers. The increase in the thickness of the retina is caused principally by the distention of these layers. Müller's fibres are here much elongated, and large spaces exist between them (see Fig. 1, *e*), which are filled with coagulated exudation and red blood corpuscles. In some places the retina is nearly normal in appearance, in other places the distortion affects the inner granular layer only, in others the change is confined to the external granular layer, and in still others the spaces extend from the ganglion-cell layer through the inner granular, inner nuclear, and external granular, deep into the external nuclear layer (see Fig. 1). The nuclei themselves appear to be unchanged. Collections of red blood corpuscles are found deep in the external nuclear layer.

The layer of rods and cones is but little affected; near the fovea centralis some red blood corpuscles and exudation have caused a detachment of this layer from the pigment layer (Fig. 1, *d*), and granular degeneration of the rods and cones is seen at this point.

Throughout the greater part of the retina the pigment layer is unaltered, but near the disc there is a hyperplasia of this layer. The newly formed cells are irregular in shape, deeply pigmented, and are heaped up to the thickness of from two to four rows. Their nuclei are quite distinct.

As to the region of the retina affected, I find that the œdema and hemorrhages extend almost to the ora serrata in the nerve-fibre layer. By far the most profound changes are observed in the vicinity of the larger vessels, *i. e.*, at the posterior part of the fundus. At the macula there is an œdematous condition as in other parts, also deposits of a colloid (?) material, which appears to be a portion of the exudation.

The disc presents a glaucomatous cupping of about 1 *mm* in depth (Fig. 2). The excavation is partly filled with a blood clot (Fig. 2, *a*). The nerve fibres here are atrophic, the layer at the margin of the disc being very thin. There is considerable increase in the number of round cells, which condition is also present in the nerve. The lamina cribrosa is pressed backwards. Numerous hemorrhages have occurred in the tissue of the disc; red blood corpuscles may be traced through the lamina cribrosa into the substance of the nerve.

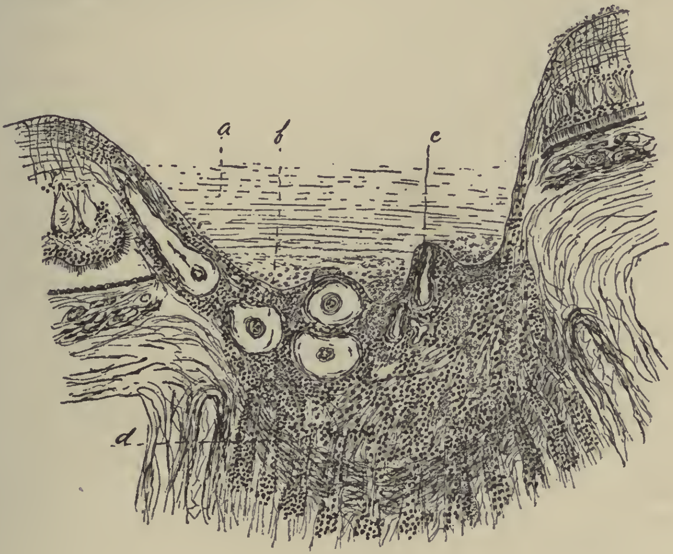

Fig. 2.

EXCAVATION OF THE DISC.—CASE NO. I.

a, blood clot filling excavation in disc; *b*, artery showing hyaline degeneration of wall; *c*, vein; *d*, lamina cribrosa.

The change in the walls of the blood-vessels, which is very appreciable, and to which the retinitis is directly due, consists in a hyaline degeneration of the intima, and in part of the muscularis of the arteries and arterioles, with, in some parts a possible fibrous thickening or sclerosis of the walls of the arterioles. By this change the calibre of the arterial vessels is partly or wholly obliterated. These changes are very well marked at the disc. (See Fig. 2, *b*). The nuclei of the endothelium of the intima are crowded together at the centre of the arterial tube. I have not observed an increase in their number, nor any sign of fatty degeneration in these cells. Except at the disc the veins are distended by red corpuscles with which they are engorged. The diminution in the *vis a tergo*, caused by the decrease in the calibre of the arteries, appears to have produced partial stagnation in the flow of blood through the capillaries and veins, followed by impaired nutrition and distention, permitting of exudation, diapedesis, and hemorrhage from them. A rupture in the walls of a vein, showing escape of red blood corpuscles into the perivascular space and into the tissue of the nerve-fibre layer is shown in Fig. 1, *b*. The drawing is from a section.

The exudation, rich in albumen and fibrine, corresponds to the plasma of the blood; a serous part produces a more or less uniform œdema of the retinal tissue; another part apparently coagulates in pocket-like spaces (situated anterior to the external nuclear layer) very soon after escaping from the vessels. Masses of homogeneous material which appears to be albumen, possibly coagulated during the hardening process, are met with; also masses which take the stain, something as colloid material does, not however so deeply. The last-mentioned material is termed colloid, by Leber[1] and others. It differs from colloid material, however, in that it does not stain so easily, and that it does not appear to be formed at the expense of the tissue in which it is found. Fatty degenerative changes take place in the masses of the exudation; however, this change is probably a slow one, as evidenced by the relatively small amount of fat observed. The deposits of fibrine are very plentiful. Red blood corpuscles are found mixed with the exudation, and are very plentiful in the tissues.

The walls of the arteries in the iris, ciliary body, and choroid, are much affected—the change being similar to that noticed in the arteries of the retina. The veins are also affected in the above-mentioned membranes, but to a much less degree than the arteries. Many of the choroidal veins are engorged with red blood corpuscles, but I have not met with any hemorrhages in the vascular tunic in this case. The chorio-capillaris is compromised in many places by a sclerotic change in the walls of the capillaries, and obliteration of many of the latter. There is a noticeable increase in the connective tissues of the part.

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[1] Gräfe-Saemisch, vol. v.

CASE NO. 2.—Adult, male. Death during an acute exacerbation of chronic Bright's disease. Kidneys contracted. The eye was removed about five minutes after death.

Ophthalmoscopic appearance: Media clear; marked papillitis; disc raised about $\frac{3}{4}$ *mm;* outline indistinct. Radiating hemorrhages not very plentiful, but most numerous near the disc. Veins engorged, enlarged, and tortuous. Color of disc and surrounding retina a pale grayish-red. Numerous diffuse and well-defined white patches about the disc and in the vicinity of the fovea centralis. The periphery of the retina shows little change; it is slightly œdematous.

Macroscopical appearance: Size of globe, appearance of cornea, iris, choroid, ciliary body, lens, vitreous, and sclerotic normal. The retina has a grayish tone at the posterior pole. Disc raised.

Microscopical appearance: Retina—the membrana limitans interna is well defined, but is thrown into wavy folds by the exudation beneath. General œdema of the nerve-fibre layer exists throughout. No infiltration of leucocytes. The glia-cells are prominent. There are no deposits of fibrine or colloid material. Hemorrhages are present, but are not numerous. This layer reaches three or four times the normal thickness in some places, due to the excessive œdema. Nerve fibres swollen.

The ganglion-cell layer is undisturbed. The cells themselves, however, are enlarged.

There is but little change in the inner granular layer; it is simply œdematous.

A large number of spaces containing coagulated exudation is seen in the inner nuclear layer. In the external granular layer, the changes are very marked; they consist in the deposition of the exudation in spaces formed by pressing the tissues apart. Müller's fibres are swollen and greatly elongated in this part of the retina. They present no degenerative change. The external nuclear layer, membrana limitans externa, rods and cones, and pigment layer are unaltered.

The changes, except an œdema of the nerve-fibre layer, are limited to the vicinity of the disc and fovea centralis. Anterior to the equator of the globe, no exudation is found. Deposits of exudation occur at and near the macula lutea, but are not observed at the fovea centralis. A condition of general œdema is present at the disc. There is but little increase in nuclei and no apparent hyperplasia of connective tissue. New-formed capillary blood-vessels are present.

Thickening of the walls of the arteries in the shape of a fibro-hyaline degeneration is seen here, but it has not reached the degree observed in Case No. 1. The character of the exudation is the same as that found in the above-mentioned case, consisting of serum, fibrine, albumen, fat, and colloid (?) material, distributed as above stated. The appearance of the deposits gives the impression that coagulation has taken place very soon after the exudation had escaped from the vessels.

CASE NO. 3.—Male adult. Death in uræmic coma. Ophthalmoscopic examination revealed an œdematous condition of the retina at and near the disc, and a few hemorrhages near the disc. Eye removed fifteen minutes after death.

Macroscopically all parts appear to be normal, except that the disc is slightly raised.

Microscopical examination: The membrana limitans interna is very wavy in outline, due to the œdema of the nerve-fibre layer. It is well defined. The nerve-fibre layer is œdematous throughout. The arterial walls are slightly thickened by hyaline infiltration. The perivascular spaces are greatly distended. The œdema is greatest in the vicinity of the larger vessels. The nerve fibres are enlarged apparently by imbibition. A few leucocytes are observed in the tissue. The ganglion cells are enormously enlarged, but they do not show any degenerative change. Only a moderate œdema is observable in the other layers of the retina. Slight hyaline degeneration is noticeable in the walls of the choroidal arteries.

Case No. 4.—Adult male. Death during an acute exacerbation of Bright's disease of the kidneys. The ophthalmoscopic examination showed marked papillitis in both eyes, with a very few hemorrhages near the margin of the disc. A globe was secured very shortly after death, and was immediately placed in Müller's fluid.

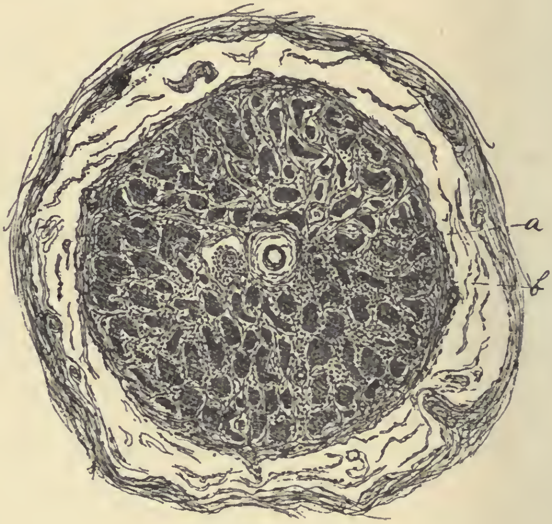
Macroscopical examination discloses nothing abnormal with the exception of a marked elevation of the disc, which is of a pale-grayish color.

Microscopical examination: The pathological changes appear to be confined to the papilla and nerve. At the papilla the tissue is greatly thickened without great increase in nuclei or infiltration of leucocytes. A new formation of capillary blood-vessels is present in the tissue of the disc. The elevation of the disc is about 1.2 *mm*, and is largely due to simple œdema, Where the deeper layers of the retina border on the opening for the entrance of the optic-nerve fibres, collections of red blood corpuscles are observed. There are also some small hemorrhages in the greatly thickened nerve-fibre layer at the margin of the disc, and some isolated hemorrhages in the same layer, which are grouped about the fovea centralis. The arteries show a hyaline degeneration of the intima, but it has not reached a high degree.

A peculiarity in this case is the relatively great inflammatory change in the nerve, while the retina remains comparatively free. A cross-section of the nerve, Fig. 3, shows an infiltration of leucocytes and a great increase in nuclei and connective tissue. The nerve-fibre bundles appear to be reduced in size and contain numerous nuclei. The walls of both arteries and veins are markedly affected, their lumen being greatly reduced. This is particularly true of the arteries. The change is one of hyaline degeneration with an increase in the connective-tissue element principally affecting the intima. The perivascular spaces are enlarged. Aside from the change in the vessels, the condition closely resembles a subacute interstitial neuritis, such as is found resulting from meningitis, brain tumor, etc. The subvaginal space is free, clearly indicating that the change is essentially an intrinsic neuritis, an inflammatory condition not caused by any virus communicated through the subvaginal space. There can be no doubt that the vision would have been greatly and permanently impaired in this case had the patient lived long after the acute attack.

Case No. 5.—Male adult. Death from chronic interstitial nephritis.

Ophthalmoscopic examination : Œdema of disc and neighboring retina ; a few small, scattered hemorrhages ; some diffuse whitish patches in the temporal side of the disc, apparently being due to exudation into the nerve-fibre layer.



Fgi. 3.

TRANSVERSE SECTION OF THE NERVE.—CASE NO. IV.

a, artery ; *b*, vein.

Connective-tissue trabeculæ much thickened ; nerve bundles reduced in size.

Globe secured 20 minutes after death. On macroscopical examination all parts appear to be normal except the retina, which shows a few very small hemorrhages and some small grayish patches at the fundus. Disc grayish in appearance.

Microscopical examination : The changes noticed are confined to the disc, nerve-fibre and ganglion-cell layers, and consist in some localized deposits of fibrinous exudation, a few small hemorrhages most numerous near the disc, some changes in the walls of the arteries, and a general œdema. The changes in the arteries consist in a slightly marked hyaline degeneration of the intima and a great distention of the perivascular spaces. An enlargement of the ganglion cells by imbibition is the change noted in that layer.

Case No. 6.—This specimen of albuminuric retinitis I obtained through the kindness of Dr. Uhthoff, of Berlin.

Excepting the fact that the fundus gave quite a typical picture of albuminuric retinitis before death, I know nothing of the previous history. Only the posterior portion of the globe was received. A slight elevation at the disc was all that appeared to be abnormal on macroscopical examination.

Microscopical examination: The retina presents the appearance of a moderate œdema of the nerve-fibre layer with small hemorrhages in the vicinity of the disc and macula lutea. The red blood corpuscles are not confined to the nerve-fibre layer, but are found in the deeper parts of the retina, particularly near the disc. Spaces exist in the deeper parts of the retina which are filled with fibrine, coagulated albumen, and red blood corpuscles, an exudation similar to that described in Case No. 1. In the periphery the retina is normal in appearance.

Papillitis is marked, the elevation reaching 1 *mm* in height. Some new-formed capillary vessels are seen in the tissue of the disc; there is also a moderate increase in nuclei. The elevation is principally due to an œdematous swelling, there being little if any hyperplasia of connective tissue. Changes in the walls of the blood-vessels in the retina are slight. The hyaline degeneration of the intima of the arterial walls occurs to a slight degree. A marked enlargement of the perivascular spaces is seen in all parts of the retina. The great peculiarity in this case is the marked change in the choroid. Extensive hemorrhages are present, being most plentiful in the region of the disc and of the macula. In some parts the membrane is distended and its whole thickness is occupied by a mass of red blood corpuscles. Hyaline degeneration of the walls of the vessels, arteries and veins, has reached a high degree, the lumen of many small arteries being obliterated. The change in the veins is not so extensive; many remain unaffected. The veins as a rule are engorged with blood. So far as can be determined, the escaped blood does not pass beyond the choroid; it does not form isolated clots, but infiltrates the tissue. In some places globular bodies are seen which are attached to the lamina vitrea. These project into the chorio-capillaris and occlude the capillaries at these points. Obliteration of the capillaries in the chorio-capillaris is also to be seen in other parts, due to hyperplasia of connective tissue and to a hyaline degeneration which has converted them into hyaline cylinders. The connective tissue of the choroid is not much increased, nor is there any appreciable change in the pigment cells of the choroid or retina.

Transverse sections of the optic nerve show marked hyaline degeneration of the walls of the artery. The nerve bundles are of normal size, and there is no evidence of degeneration of nerve fibres.

The description of one other eyeball might be given, but since it shows only a marked œdema of the nerve-fibre layer at and near the disc, and gives no new feature for this paper, it will pass with this notice only.

From the above reports of eyes examined microscopically, it becomes very evident that changes accompanying albuminuria may affect all parts of the eye, except possibly the fibrous tunic, the retina usually being the part most profoundly changed.

Vision may be but slightly or not at all diminished, or, as in Case No. 1, it may be entirely lost. Fürst[1] mentions having seen a few cases of absolute blindness following the albuminuria of pregnancy, the patient having recovered from the kidney disease. One case has come under my notice in which atrophy of the optic nerves was well advanced seven weeks after confinement. V $\frac{1}{\infty}$ in both eyes. The failure in vision was first noticed very shortly before confinement and had steadily increased. There was a mild papillitis and numerous white plaques, but no hemorrhages. The urine contained some albumen, and there was an unmistakable history of marked albuminuria of pregnancy.

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[1] *Berl. Klin. Wochenschr.*, 1887.

Monocular albuminuric retinitis has been observed and reported, but the belief is very prevalent that sooner or later the second eye will become affected. Cheatham[1] reports two cases of monocular albuminuric retinitis. One of the patients, in whom the left eye was affected, died, and autopsy showed the left kidney only to be diseased. In the second case albumen and casts were present in the urine. $V = \frac{20}{20}$ R; $V = 0$ L. After five weeks of treatment, $V = \frac{20}{20}$ R; $V = \frac{20}{40}$ L. Bull[2] mentions ten cases where one eye only was affected, but lays no particular stress on the fact, seeming to think that the second eye would not escape.

Case No. 1, reported somewhat at length, appears to be a very good illustration of monocular albuminuric retinitis, and is unique as regards the development of secondary glaucoma. I am not aware that the literature of albuminuric retinitis presents a parallel case. The decrease in tension which first obtained was followed by an increase accompanied by pain and total loss of sight. The eye was removed on account of the pain which it caused. Eighteen months have elapsed, still the left eye remains normal, although albumen and casts are present in the urine.

Regarding the anatomical changes affecting the eye in albuminuria, it is safe to say that there is but little inflammatory action involved; there is but little infiltration of leucocytes and increase of nuclei, and very little hyperplasia of connective tissue, such as we would expect to find in so chronic a condition if true inflammation were present. Extravascular, the condition usually is simply one of the escape of the elements of the blood from the vessels,—in mild cases the watery portion producing simple œdema; in severer cases all the elements of the blood leading to such marked changes as are found in Case No. 1. The escape of the elements of the blood from the vessels must of course be due to some influence that weakens their walls, an impairment in their nutrition. This may be produced by a change in the chemical composition of the blood, or by a diminution in the supply by obstruction, etc., or both conditions may obtain at the same time.

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[1] *Jour. Am. Med. Assoc.*, 1885, 5, p. 150.
[2] *N. Y. Med. Jour.*, July 31, 1886.

Complete restoration of vision occurs in many of the milder cases when the kidney disease is recovered from, as in the albuminuria of pregnancy, because of the complete absorption of the exudation. When large hemorrhages occur, and in the exceptional cases where there is a large increase in the connective tissue, etc., full restoration of vision cannot occur and absolute blindness may result.

An interesting feature in albuminuric retinitis is the relatively great size obtained by the ganglion cells, brought about by imbibition,—a part of the general œdema. No marked pathological change is present in them, except very slight granular degeneration of isolated groups.

Granular or fatty degeneration of Müller's fibres, as mentioned by Carl Theodore and Leber, has not been observed in the cases above reported. It is very probable that this is a post-mortem change, the time usually elapsing between the death of the person and the placing of the globe in Müller's fluid being sufficiently long to permit this change to occur.

It is conceded by most writers that the hemorrhages in retinitis take place from the veins and capillaries. When arterial stenosis is present the manner of its production is probably something as described by Knapp[1] in the report of his case of amyloid degeneration of the choroidal arteries. He says: "The force of the current, already greatly diminished by the resistance in the degenerated arteries, was now distributed over the immense space of the capillaries and veins of the choroid by which it must have been reduced almost to a minimum. Stagnation was the immediate consequence. Stagnating blood must soon lose its nutritive power, on account of which the walls of the vessels become diseased, softened, and frail. If now in some veins stasis by coagulation or over-distention takes place, and the corresponding arteries continue to pour in even never so little blood, a rupture in the capillaries, the weakest link in the chain, must take place." Loss of the *vis a tergo*. This condition is also represented when embolism or thrombosis of the arteria retinæ centralis occurs; also in cases of great loss of blood from the system, as in *post-partum* hemorrhages.

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[1] ARCH. OF OPH. AND OTOL., vol. iii., No. 2, p. 115.

Leber denies the occurrence of hyperplasia of retinal pigment in the retinitis accompanying albuminuria. Case No. 1 of the above series shows a condition of hyperplasia of retinal pigment very beautifully.

Hyaline nodules, formations on the lamina vitrea of the choroid are frequently met with in old people when no other diseased condition exists in the eye. They are well marked in Case No. 5. What influence the albuminuria had in producing them cannot be determined.

The detachment of the retina which is sometimes observed in retinitis accompanying albuminuria is due to the presence of the exudation beneath the retina. In Case No. 1 the exudation is found between the membrana limitans externa and the retinal pigment, and evidently proceeded from the retinal vessels. See Fig. 1, *d*.

The extensive choroidal changes observed in Case No. 5 shows that the degeneration in the arteries develops irregularly, and may be even more marked in the choroid than in the retina.

In the study of albuminuric retinitis, it becomes apparent that, in regard to their etiology, two classes of retinal disease are included in the present acceptance of the term. One depends almost entirely on the condition of the blood brought about by an acute disease of the kidneys, the kidney symptoms preceding the change in the retina; the other depending on a general (systemic) diseased condition of the arteries, capillaries, and, to a less extent, the veins, in which the ocular changes and symptoms may and not infrequently do precede the kidney symptoms (Stewart,[1] Mahomed,[2] Schuchardt,[3] Lemcke[4]). To the first belongs the retinitis of pregnancy, scarlet-fever, diphtheria, etc., and all forms of acute diffuse nephritis, forms usually accompanied with general anasarca. In these cases the œdema and white plaques are the first evidence; hemorrhages, more or less numerous, often follow. To the second class belong the cases in which the first retinal change is a hemorrhage or a few small hemorrhages, usually in the vicinity of the macula. The œdema and white plaques (which represent coagulable exudation and its subsequent changes) appear later. Contemporary with, preceding or following the hemorrhages in the retina, we may find evidences of capillary hemorrhages in other parts of the system (Lemcke[1] and others), as in the cord, brain, from mucous membranes, etc. Anasarca is seldom a very marked condition in this form of disease. The first may be termed an irritation-nephritis, due to the effect of a morbific element on the kidney tissue, in which the kidney usually becomes enlarged, and the circulation interfered with by pressure on the vessels from the swollen tissue. The latter, a strangulation-nephritis, in which the blood supply is cut off by arterial stenosis, the kidney being always found contracted, and in which the morbific element contained in the blood causes a thickening and degeneration of the walls of the vessels with a diminution of their lumen. Both conditions may exist at the same time in varying degrees.

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[1] Trans. Int. Med. Cong., Lond., vol. ii., p. 109, 1887.

[2] *Idem*, p. 114.

[3] *Berl. klin. Woch.*, p. 41, 1882.

[4] *Deutsch. Arch. f. klin. Med.*, vol. xxxv.

A large percentage of the cases of retinitis accompanying albuminuria undoubtedly belong to the latter category. An excellent example of this condition is presented in the case reported by Lemcke in the article referred to above. The patient was forty years of age, and when first seen presented briefly the following conditions: Hypertrophy of left side of heart, slight œdema at joints in lower extremities, urine a little less than normal in amount, no albumen. Ophthalmoscopic examination showed retinal hemorrhages not numerous, a very few white plaques in the retina, veins tortuous and engorged, arteries diminished in size, disc hazy at margins, $V = \frac{20}{20}$.

The patient was under direct observation about two years and a half. Albumen became very plentiful at the end of one year, continued so for some months, and then became much less in quantity. At about this time petechiæ were noticed on the extremities. Skin became dry and discolored, patient emaciated. Hypertrophy of left ventricle increased. More hemorrhages in the retina. Vision but little impaired. On microscopic examination, post mortem, the walls of the arteries, arterioles, and capillaries in all parts of the body were found to be greatly thickened, the process affecting the intima principally. Heart hypertrophied. Kidneys shrunken.

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[1] *Deutsch. Arch. f. klin. Med.*, vol. xxxv.

The changes in the vessels are referred to by Ziegler[1] (changes observed in the kidneys) as hyaline degeneration of the intima, and arterio-sclerosis, Gall and Sutton[2] (observed in cord and brain) as arterio-capillary fibrosis and hyalo-fibrosis, Carl Theodore[3] (observed in retina, choroid, iris, etc.) as hyaline thickening of the intima; Meigs[4] (observed in larger arteries and veins) as fibrous thickening of the intima. Ziegler described it as affecting the intima and muscularis, Gall and Sutton as affecting the intima, muscularis, and adventitia, Carl Theodore and Meigs as affecting the intima. The condition is evidently termed amyloid degeneration by many of the older writers (Currie and Ranvier, Green, Rindfleisch, etc.), but the amyloid reaction with iodine and sulphuric acid cannot be demonstrated in all of the cases. That the material is albuminous in nature is conceded, I think, by all. Litten,[5] in an investigation of eleven cases of hyaline degeneration in the walls of the arteries in the kidneys, points out the relation existing between hyaline and amyloid material, and considers them to be different stages of the same process. No amyloid reaction could be obtained in the reported cases above. In regard to the formation of the hyaline material, Carl Theodore is of the opinion that the substance is produced by a transudation of white blood corpuscles through the intima of the vessel, where they lodge, and from perverted nutrition gradually lose their outlines and become converted into a hyaline mass. This is conjecture only. There does not appear to be any satisfactory or positive explanation of the development of this substance.

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[1] "Path. Anat."

[2] Trans. Path. Soc., London, vol. xxviii., 1877.

[3] "Zur Path. Anat. des Auges," Wiesbaden, 1887.

[4] *N. Y. Med. Record*, July 7, 1888.

[5] *Deutsch. med. Woch.*, p. 517, 1887.

Cases illustrating the pre-albuminuric stage of retinitis have been observed by many ophthalmologists. Gand[1] reports thirteen cases. Delalande[1] reports twenty-three cases accompanying atheromatous degeneration of the arteries, with and without albuminuria. Trousseau[1] reports three cases.

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[1] *Sajous*, *Annual*, vol. iii., Phila., 1888.

A CASE WITH HIGH DEGREE OF ASTIGMATISM AFTER CATARACT EXTRACTION IMPROVED BY OPERATION.

By Dr. HJ. SCHIÖTZ, Christiania.

A. S., mason, 33 years old, was admitted on November 20, 1882, to the ophthalmic division of the State Hospital, with cataracta zonularis of both eyes. On the left eye an iridectomy upward was performed, and the lens extracted after being rendered completely opaque by several incisions. A part of the lens remained, however, in the anterior chamber. During the healing process, which progressed without any symptoms of irritation, a piece of the lens mass came to lie against the inner side of the wound in such a way as to push the corneal flaps forward. This was undoubtedly the principal cause of a considerable alteration in the corneal curvature that showed itself, and even persisted when the lens mass was entirely absorbed and the eye in other respects was normal.

The ophthalmometric measurements hereafter given have been obtained with the Javal-Schiötz instrument.

Before the operation, the examination showed :

$$0^\circ + 1\ ;\ 90^\circ + 0.6.$$

(The figures to the left of the semicolon are for the left eye; those to the right for the right eye. The degrees give the position of the meridian of maximum refraction ; 0° indicates the vertical meridian, and from this the degrees are numbered towards the patient's right, 15°, 30°, etc. The figures with the symbol + indicate the difference between the two principal meridians of the cornea, expressed in dioptries.)

The left eye accordingly showed a corneal astigmatism of 1 dioptrie, the vertical meridian being that of maximum refraction. The radius of curvature for the cornea in the meridian of weakest refraction was 8.26 *mm*, in the meridian of maximum refraction 8.16 *mm*.

About four months after the extraction, the examination with ophthalmometer and optometer gave the following results :

$83° + 19.5$;
$85° + 8 + 6$;
Visus, $\frac{20}{100}$;

i. e. a corneal astigmatism of 19.5 dioptries.

With Javal's optometer, the strongest cylinder of which is only 8 D, the best combination found was that of a convex cylinder of 8 D, with a spherical glass + 6 D, the axis of maximum refraction being 85°. A more exact correction of the astigmatism by means of a combination of two cylindrical glasses was attempted ; the patient preferred, however, the above combination. The discomfort caused by the use of the stronger cylindrical combination outweighed the advantage of a more exact correction. It deserves attention, however, that the visual acuteness reached $\frac{20}{100}$ in spite of the high degree of astigmatism remaining uncorrected.

One sees easily on examining the cornea, that it forms an upright ellipse, the upper part of which, corresponding to the scar, bulges forward. On keratoscopic examination with the Javal disc, the picture was a pretty regular, upright ellipse, with vertical axis twice as long as the horizontal. The corneal radius in the meridian of maximum refraction was 9.852 *mm*, in that of minimum refraction, 6.366 *mm*.

The patient was again examined on January 30, 1884, about one year after the operation. The appearance of the cornea was unchanged, and the ophthalmometric examination gave the same result (19.7 dioptries corneal astigmatism).

He was again admitted to the hospital, on Februaiy 1, 1884, in order to have the iridectomy, discisiion, and extraction of the zonular cataract on the right eye done. Meanwhile, however, the attempt was first made to improve the curvature of the left cornea by an operative procedure.

On February 12th an incision upwards was made with a Graefe knife through the base of the most bulging part, and a small flap cut away with the Wecker scissors after the wound had healed without any trace of reaction, the patient was again examined on February 27 ; there was no change noticed from the results of the previous examinations, the degree of the astigmatism and the radii of corneal curvature remaining the same.

The operation was repeated on March 1st, essentially in the same manner as before. An attempt was however made to cut a small flap from the upper lip of the wound.

On March 13th the corneal astigmatism, as determined by the ophthalmometer, was 15.75 D, the radii of curvature 9.17 *mm* and 6.49 *mm*, showing a diminution of 3.75 dioptries in the astigmatism.

The patient was again operated on March 22d. The operation was this time confined to an incision with the Graefe knife. It was made upwards and inwards (this latter because the cicatrix bulged here considerably), and in such a way that the incision made an obtuse angle with the direction of the corneal section in the original cataract-extraction. This cut was carried through the inner part of the cicatrix, and also the adjoining inner corneal border, a distance of about 3.5 *mm*. After the wound had healed, the astigmatism was found on March 31st reduced to 11.29 dioptries.

$$110^\circ \pm 11.29;$$
$$105^\circ + 6 + 8;$$
$$V = \tfrac{20}{70}$$

The corneal radii were 8.688 and 6.78 *mm*. On repeating the examination April 22d, a progressive diminution of the astigmatism was observed, the results being:

$$105^\circ \pm 9.5;$$
$$100^\circ + 6 + 9;$$
$$V = \tfrac{20}{50}$$

Finally, on Aug. 12th, the ophthalmometric examination resulted as follows:

$$100^\circ + 7;$$
$$100^\circ + 5 + 11;$$
$$V = \tfrac{20}{50}$$

The corneal radii were now 8.75 *mm* and 7.45 *mm*. A later examination on November 25th gave the same results.

This case seems to me worthy of attention, not only as an example of the marked and permanent alterations of curvature which may occasionally present themselves in the cornea, but above all on account of the favorable results upon the altered curvature, which were obtained by operative procedure. The astigmatism was reduced from 19.5 dioptries to 7. After operations such as iridectomy, and particularly cataract-extraction, a not inconsiderable degree of astigmatism is wont to show, but this in almost all cases disappears in the course of a couple of months, either completely or at least (and this is the most common result) to such an extent that at most a difference of 2 dioptries remains. Where, however, some lens matter remains in the eye and comes to lie near the corneal wound in such a way that on swelling it pushes forward the anterior lip of the wound, or where other conditions tend to the production of a cystoid scar, alterations of curvature must develop, and of a kind that do not disappear spontaneously. As far as I know, the case here reported is the first in which astigmatism has given the indication for an operation.

In this connection we feel justified in holding that the partial excision of the cicatrix proper exerted only a proportionally trifling effect on the curvature of the cornea: on the other hand, the division of the normal parts adjoining the cicatrix, by an incision making an obtuse angle with the original corneal incision, proved specially efficacious. This was, however, to be expected, as the abnormal corneal curvature must be most marked immediately on either side of the bulging scar.

Congenital corneal astigmatism will scarcely ever afford an indication for operative interference, as, so far as I know, it never exceeds 6–7 dioptries, with a limit of 8 dioptries for the total astigmatism.

CLINICAL MISCELLANIES.

By Dr. I. GROSSMANN, of Buda-Pest.

Translated by Dr. J. A. Spalding, Portland, Me.

1.—*A contribution to skin- and mucous-grafting.*

REVERDIN'S operation and its modifications have proved so valuable in general surgery, that ophthalmic surgeons have resorted to grafts of skin without a flap instead of the old flap operations for restoring the lids, etc. The results have generally been good.

Many authors are asserted to have tried the plan previous to Wolfe, so that the question of priority is still undecided. Wecker amongst others has done "mosaic" grafting with some success, whilst irregular transplantation of small bits of skin has been repeatedly employed. We learn, too, from Bock's monograph, that Stellwag modified Reverdin's method as far back as 1878 by using bits of mucous membrane, and that he expressed the opinion that the danger of losing the flap from suppuration was greater with a pedicle, than in simple transplantation. "But," adds Bock, "if we do not succeed in healing by first intention the plastic operation is rendered hopeless, and in many cases the chance for a second operation destroyed owing to the almost total loss of skin in the neighborhood."

"If, on the contrary, transplanted skin dies, recovery may be delayed, but the injury can again be made good. For even if the patient cannot furnish the skin we can get it from others, or even from the corpses of those who may not have died of contagious diseases."

Bock's tables show that 97 operations were performed at Stellwag's clinique, the material being taken chiefly from the upper arm, twice from an amputated stump, and once from over the lower rib. All but eight of the operations were successful, permitting free motion of the eye.

Thirty-three cases of mucous grafting are also appended, 26 being done with rabbit's conjunctiva, and the rest with mucous membrane from various parts of the body. Of these, 27 were successful.

I now add the following case :

May 16, 1884. J. F., a laborer, æt. 62 ; mature cataract R. E., immature, L. E. He first noticed three years ago in the inner angle of the left eye a hard nodule which gradually expanded into an open ulcer.

The lower lid has an ulcer 3 *cm* long, and 1 broad, covered with crust and a thin secretion. The canthus is occupied with a similar ulcer, extending upon the nose. The case was diagnosticated as carcinoma, and the operation done May 19th.

The disease was eradicated to the bone with knife and scissors, and the abundant hemorrhage checked by ligating the vessels. The bleeding surface was covered with cloths dipped in iced-water. I next removed from over the biceps a flap of skin a third larger in every direction than the space to be covered, and cleansed it of fat and connective tissue.

The bleeding continued so abundant, that the transplantation was postponed to the following day, the flap being kept in cloths moistened with boric solution, and the arm sutured and bandaged.

On the next day the graft was cut into eight pieces, which were fitted as neatly as possible to the prepared surface and held in place with oiled silk and a bandage.

Three days later the lid was uncovered and found in a healthy condition, with slight secretion, and a few bits of softened epidermis.

By the 8th of June, a perfect covering had been obtained for the eye.

June 10th, cataract extraction R. E.; incision downward, small iridectomy, and no accident. Final S $\frac{20}{60}$, and a neatly shaped left lower eyelid.

2.—*Partial symblepharon of the left lower eyelid.*

Mrs. S., æt. 52, came for partial loss of mobility of the left eye. Examination of the right eye also shows a defect ; three delicate strands of conjunctiva at the extreme lower fold extend from the lid to the globe.

Lower lid of left eye everted, and a bridle of connective tissue 6 *mm* wide extends from just within the inner margin of the lid to the conjunctiva 2 *mm* beneath the cornea. The conjunctival surface from the cornea to the spot where the connective tissue united with the globe is white and shiny as if it had been touched with a silver-nitrate pencil. But there is no secretion. The patient cannot look down, owing to an adhesion between the upper lid and conjunctiva. Vision normal, slight Hm.

The symblepharon had been caused by a mixture of pepper and sugar blown into the eye by order of a charlatan. This irritating substance probably excited inflammation and loss of tissue with subsequent granulation and union of the opposite surfaces. The band of overlying tissue is probably xerosis, due perchance to imperfect closure of the lids.

The shiny deposit on the cornea was shaved off under cocaine, but unfortunately lost. All remaining adhesions of the left upper lid were divided with the scissors as far as the fold, and the loss supplied by an oval piece of vaginal mucous membrane. Both eyes were then closed. By the third day the mucous flap had united.

Three days later the left lower lid was freed in a similar way, and the loss supplied by vaginal mucous membrane cleansed with boric solution. Furthermore the large space in the fold was filled in with a mucous graft held in place by a suture running through the lid, and supported by a small roller on the cheek outside.

The patient was sent home in a week with satisfactory result: the eye rotated freely in all directions, the conjunctival wound seemed entirely covered with epithelium, and the conjunctival fold was restored. The middle of the lid had resumed its normal position, and the conjunctival surface glistened normally.

3.—*Sixfold paralysis of the left cerebral nerves.*

A. Z., æt. 44, has always been delicate; menstruation generally accompanied with cramps in the legs. At the age of 20 she had a child that lived but twenty days, dying from "weakness."

January 18, 1885.—Diplopia, vertigo, deafness, and tinnitus in the left ear.

Right eye moves normally in every direction; left pupil smaller than the right on convergence, but reaction and accommodation are normal in each eye. On covering the right eye, the left fixes with difficulty ; and the right converges by association, but the left can then hardly move to the sagittal line. It is therefore deficient in lateral motion. With increased impulse of the will it merely moves zig-zag outward and upward, or outward and downward. On looking straight ahead, and holding the object in the median line, the left eye deviates inward before the right visual line reaches the sagittal plane. This is more marked when the object is held to the left (pathological divergence). The object is single in the right field of fixation, but horizontally to the left diplopia ensues. The double images are parallel and on the same level, but the farther to the left the object is moved the greater the lateral distance of the images.

In intermediate positions to the left, the images differ in height and obliquity. The image is projected to the left, and the patient grasps at it still farther to the left, vertigo ensues, and the head is involuntarily turned to the right, so that the image may fall into the right half of the field.

Diagnosis : *Left abducens paralysis.*

Myopia slight, with downward conus.

The lips sag to the right ; uvula normal, left lagophthalmus.

Left membrana tympani opaque, light spot faint. Tuning-fork, 2½ *cm* left ear, 50 *cm* right ear. Bone-conduction best in right ear ; watch 0 left ear, 85 *cm* right. The consonants C, P, F, and W barely perceived ; left ear at 1 *cm*. Hearing not improved by catheterization. Roaring and rushing in the ears at night ; patient thus made sleepless ; syphilis denied.

Patient declined to stay in the hospital, but was brought back in a short time on account of a profuse epistaxis, resulting in extreme prostration. I saw her again in March.

Left forehead anæsthetic, lagophthalmus more noticeable, and the left eye rotated up under upper lid. Abducens paralysis as before, cornea insensible to the touch, mouth distorted, left half of face and lips anæsthetic, and smell in the left nostril lost except for strong aqua ammonia.

Bone-conduction for the deep C fork only ; c^4 and *f* sharp^4 very faintly perceived.

Stuttering and slowness of speech ; tip of tongue directed to left ; no taste on left anterior portion of tongue, but perfect taste on opposite side.

Difficulty of deglutition, weakness in left extremities, loss of grasp in left hand, and inability to stand on the feet, the inner surfaces of which are very insensible. No vomiting or vertigo, mind clear, no albumen or sugar in urine.

The history shows paralysis of the abducens, then of the facial, including its upper branches.

The sound-perceiving apparatus appeared diseased because the drum membrane was nearly normal, and the deafness was not relieved by catheterization. The results of the tuning-fork tests for bone-conduction pointed the same way.

The trigeminus was paralyzed in both motor and sensitive branches, as shown by the behavior of the masseter muscles, and the anæsthesia of the left half of the forehead and face, as well as of the cornea and conjunctiva of the left eye. The left-sided anosmia was partly due to trigeminal anæsthesia, and partly to facial paralysis, but the olfactory nerve may also have been paralyzed.

The dysphagia indicated glosso-pharyngeal paralysis, although the same disease in the hypoglossus may have contributed to the difficulty, for the facial innervates this function by branching to the styloglossus, stylohyoideus, and digastricus, and the hypoglossus regulates the motion of the tongue.

The poor articulation betrayed hypoglossal paresis.

The lack of taste arose partly from anæsthesia of the lingual branch of the trigeminus, and partly from disease of the glosso-pharyngeus.

There must have been a lesion at the base of the brain to excite so extensive a paralysis of the 5th, 6th, 7th, 8th, 9th, and 12th pairs, or if within the brain, at the pons Varolii. According to Nothnagel (" Topische Diagnostik der Gehirnkrankheiten "): " Paralysis of the motor and sensitive nerves is more frequent than irritation of the same in diseases of the pons, which are characterized by alternating paralyses. The latter chiefly attack the motor and sensitive nerves on the opposite side, whilst the cerebral motor nerves, *e. g.*, the trigeminus, abducens, facial, etc., are generally paralyzed on the same side with the morbid focus."

" Simultaneous affection of cerebral motor nerves and those of the extremities is most generally noticed. We rarely see a paralysis limited to the motor cerebral nerves in an affection of the pons."

The only support for such a disease in my case was cerebral motor nerve paralysis. Yet the absence of alternating paralysis of the extremities rendered this diagnosis doubtful. Nevertheless, after learning (Nothnagel) that this spmptom was not essential, I clung to a disease of the pons.

Other symptoms favoring this diagnosis were paralysis of the facial and abducens, the excessive trigeminal anæsthesia with anæsthesia of the left extremities, and finally the dysphagia and paralysis of the hypoglossus as manifested in the disturbance of articulation and defective motion of the tongue. The bulb of the medulla may also have participated in the lesion, since the nerves which govern the motion of swallowing originate there. Moreover, neither mind nor consciousness was at all affected, and the faradic excitability of the facial was lost and galvanic irritation but slightly perceived, whilst, on the contrary, increased galvano-muscular contractility was visible after direct galvano-muscular irritation.

Finally, we had to consider the altered function of the nerve of hearing, for although affections of the organs of sense are not important symptoms in diseases of the pons, yet Nothnagel hints that we should not forget unilateral deafness in making up our diagnosis.

This patient could not have been paralyzed by hemorrhage within the pons, or from a softened focus, for the former kills the patient quicker than a cerebral hemorrhage, and if the patient survives, epileptiform spasms (absent here) are more frequent, and for the reason that the reflex centre for convulsions lies in the pons. Hemorrhage from a softened focus could be excluded, because such an occurrence can only be relied upon for a diagnosis several weeks after the injury (8 to 12).

There was nothing to indicate a stationary encapsulated abscess.

The history seemed to indicate syphilitic gummous periostitis at the base of the brain, terminating in pressure on the basal surface of the pons. That the pressure existed there, and not elsewhere, was proved by loss of function of the motor tracts, which lie nearer the basal than the dorsal surface of the pons.

Potassic iodide, 1 grm. daily. In ten days dysphagia began to yield, and in ten more, after increasing the iodide, it had disappeared. The tongue also moved more rapidly, and the eye could be voluntarily rotated beyond the sagittal line.

The rapid improvement sustained the diagnosis of syphilis and gumma, because in brain diseases there could not have been such rapid amelioration.

The iodide was pushed to 4 grm. daily, and on alternate days galvanism was tried. The patient improved slowly but constantly, and on the eighty-fourth day left the hospital against my wishes, improved, though not cured, in the following condition :

Extremities stronger ; sensibility normal ; no facial anæsthesia or lagophthalmus ; left eye mobile ; pupil smaller than right ; diplopia only on extreme abduction to the left ; masseter muscles normal ; tongue projects a little to the left ; hearing increased in left ear to 4 *m*, whilst the c^4 and f $sharp^4$ forks are not so distinctly heard by bone-conduction in the left ear as before.

A fortnight later she brought a piece of bone 23 *mm* long, 17 high, and 12 wide, coughed up the day before. It was porous, necrotic, and ragged. Rhinoscopy showed that it had been exfoliated from the root of the left pterygoid process. It was probably due to ostitis gummosa, concerning which Zeiss says :

"Gummata may originate from the embryonal connective tissue formed within the medullary space."

And Virchow remarks :

"The peculiarity of necrosis of the skull in the course of constitutional syphilis argues in favor of the gummous form, because the necrosis generally extends from within outward. The dying bone, coarse, porous, and apparently worm-eaten, loosens itself from the living bone by a more or less zig-zag line of demarcation."

"Such foci are often numerous, sometimes separate, and sometimes adjoining, and in the latter case becoming confluent and producing great destruction."

After this sequestrum was exfoliated the ocular paralysis and diplopia disappeared, the masseters became normal in action, and the mouth mobile. The anosmia was still present, indicating that the olfactory nerve at the base of the brain was still subjected to pressure.

On returning from my vacation in August, I was informed that the patient died July 31st, after a profuse epistaxis on the previous day, and that an autopsy had been refused.

Remarks.

1. The effect of the administration of the iodide seems to justify my belief that the lesion in the pons depended on bone disease at the base of the skull, because so rapid an improvement would not have been seen if the disease had been intracerebral.

2. The sequestrum, which was apparently due to ostitis syphilitica, proves that a gumma can originate from the embryonal connective tissue in the medullary space as well as under the periosteum.

3. The patient died from the sudden and enormous loss of blood. From the manner in which it is said to have gushed from the nostrils, it is plain that some great artery, either the carotid or basilary, must have burst from erosion, whilst the earlier attacks of epistaxis resulted from the rupture of smaller vessels.

4. Finally, we are to remark that, although the paralysis decreased and the general health improved, yet the bone disease continued to progress, and at last terminated life by eroding an artery.

A CASE OF DYSLEXIA (DYSANAGNOSIA, LESESCHEU) WITH AUTOPSY.

By Dr. A. NIEDEN, Bochum.

Translated by Dr. Wilmer, New York.

In the literature of ophthalmology, as well as in that of neuropathology, we find the above symptomatic term as an addition of a very recent date. Berlin[1] was the first, from his observation of five cases, to draw attention to this symptom at the Congress of German neurologists in 1883. He recognized this as an early and characteristic symptom of certain cerebral affections, as well as an important factor in its bearing upon the prognosis of the case.

The term "dyslexia," as used by him, signifies an inability to read to one's self or aloud for a short time—*i. e.*, not more than four or five words. There is no blurring nor swimming of the letters and words; no pain in the eyes or head, but simply, as Berlin correctly designates it, a disinclination, as if it were impossible to make the necessary mental effort.

The disturbance generally makes its appearance suddenly, and is the first symptom that points to disease of the brain.

Besides headache and dizziness this symptom was always followed by other evidences of a cerebral affection. In the reported cases aphasia occurred twice; right-sided hemianopsia once; disturbance in the movements of the tongue twice; right-sided paræsthesia twice; hemiplegia twice

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[1] Prof. Dr. R. Berlin: Ueber Dyslexie. Vortrag auf der Versammlung Südwestdeutscher Neurol. und Irrenärzte am 17. Juni, 1883. *Baden-Baden, und Med. Corresp.-Blatt. d. Würtemb. ärztl. Landes-Versamml.*, 1883, No. 27.

(being right-sided in one case); and clonic contractions of the facial muscles of the right side once.

All of Berlin's cases, now six,[1] ended fatally after a longer or shorter duration of the disease. Four of the patients were males and two females, and their ages varied from 30 to 72 years.

The above-shown frequency with which the hemiplegia, paræsthesia, and spasms of the facial muscles occur on the right side, would lead one to suspect a lesion of the left hemisphere, especially that part of the cortex between Broca's frontal convolution, the facial centre, and the central convolutions.

Berlin was lately able to confirm by autopsy his view, which he advanced five years ago, regarding the probable seat of the pathological changes giving rise to the above-mentioned symptom.

But it is only when the ophthalmologist has excluded all other similar symptoms, generally grouped under the term hebetudo visus, that the neurologist can use this decidedly important initial symptom of cerebral disease.

So the knowledge of this affection is important and interesting to members of these specialties, and serves as a bond to unite still more closely those branches that are already so intimately connected.

I hope by reporting a similar case not only to enrich the literature of the subject which is still scant, but also to convince my fellow-specialists of the necessity of being familiar with the appearances of this disease.

On July 12th, of this year, I was summoned to see a patient in consultation, who, for some weeks after a sudden eclamptic attack, had suffered from a great loss of strength, though apparently no single organ was at fault.

From the convulsive seizure which occurred in the course of the next week, and from the fact that the patient was no longer able to read continuously, the attending physicians suspected some cerebral trouble, and desired an ophthalmoscopic examination.

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[1] Vortrag auf der XI. Versamml. Südwestdeutscher Neurol. und Irrenärzte am 22. und 23. Mai, in Baden-Baden. Cf. *Corresp.-Blatt. f. Nervenheilk.*, von Erlenmeyer, Bd. IX., S. 362.

I found a strongly-built man, 39 years of age, who was by vocation a painter and decorator. With the exception of a certain relaxation of body and features, he showed no outward sign of disease.

The following history was obtained: Early on the morning of June 22d the patient, having retired in perfect health and slept well, was found by his wife in severe convulsions, after making an attempt to look at his watch which was on the left side of the bed. He was unconscious, answered no questions, eyes were closed, the head was buried in the pillow, while the whole body was tossed to and fro so violently that it was impossible to hold him upon the bed. A preponderance of the spasms upon one side was not noticed, the breathing was labored and moaning, and the thumbs, to which the layman in this part of the country first directs his attention, were not bent in.

The attack lasted about 20 minutes, and was followed by a general relaxation of the body; consciousness returned, and the patient complained of great soreness in all the limbs. Severe headache and pain in the nape of the neck on the left side, which was increased by pressure upon a corresponding portion of the vertebral column. There was also a tender spot over the dorsal vertebræ and the epigastric region.

The feeling of weakness and the headache disappeared in the course of the next day, and in a short time he returned to his business.

June 28th, exactly 8 days after the first attack, there was a repetition, following an afternoon nap. Shortly after falling asleep, he was again found rolling about unconscious in bed.

Dr. Reinhard, his physician, arrived quickly and recognized an eclamptic attack. The spasms chiefly involved the upper extremities, seemingly to an equal degree on either side. The upper portion of the body was twisted around its long axis towards the left, while the head was pressed against the mattress. There was complete loss of consciousness; the pupils, under the closed lids, were contracted and immovable; the pulse was small, hard, but regular. There was no involuntary passage of urine and fæces; the tongue was uninjured.

After a duration of half an hour the spasms gradually ceased, consciousness returned and the patient complained more of headache and pain in the limbs than formerly. The loss of strength was more marked and the convalescence slower than after the first attack.

No pathological manifestations either in bodily or mental functions remained, except a tendency to syncopal attacks after violent exercise or when worried by business or domestic affairs. Appetite was good, sleep sound, and pulse normal (full and strong), though it had fallen from 76 or 78 to 60 beats a minute.

After a day or so, when the patient wished to read, it became unpleasantly noticeable that he was unable to direct his glance at the print for longer than a few seconds, or to recognize and read a few words, without feeling compelled to turn away his head.

The patient stated explicity that there was no blurring nor swimming of the letters when an attempt was made to read, but an unconquerable inclination to turn away the head, just as if his mental energy were exhausted by this slight effort.

The patient, a hypermetrope of moderate degree, wore constantly for years convex glasses (+ 1.25 D), and at first believed that his inability to read depended upon the unsuitableness of the correcting glasses. He changed his glasses from + 2.5 D down without any improvement.

Alarmed by this circumstance and owing to the desire of the attending physicians to learn the result of an ophthalmoscopic examination, the patient consulted me.

I found the motility of the eyes good and the reaction of the pupil normal (under the influence of light and in the act of accommodation and convergence). There was 1.0 D lat. H, the refracting media and fundus were normal, and there was apparently no hyperæsthesia of the retina during this brilliant illumination.

With the error of refraction corrected, $V = \frac{20}{20}$, and the single letters were deciphered rapidly and without difficulty. In testing the near vision, the patient read promptly and correctly the first four words of No. 1. (my scale), then with an expression of annoyance suddenly turned away from the book, declaring that he could read no further. Urged to make another attempt, he willingly did so, with the same result as before.

In the beginning of this peculiar condition the patient presents more of the symptoms so well known under the head of "asthenopia." There is merely a certain feeling of disinclination (or dread) to read further, which is shown in the whole attitude and behavior of the patient, and which is so characteristic that, being once seen, its peculiarity is never forgotten.

I was immediately impressed with its similarity to the first stages of hydrophobia, when an attempt to drink is made. In both cases there is the same movement of dread and rapid turning aside of the head to repel that which was desired, and again an attempt is made to accomplish what has just proved futile.

In our case this inability to read remained, irrespective of the size and character of type used. I urged the patient to make an effort to read further for me, and with evident effort he read one or two words more.

This mental exertion was always followed by a sort of fainting attack, which set in of late more frequently. He sank back exhausted, complaining that he perceived a peculiar foul odor.

Patient was able to repeat words and sentences and to write from dictation without any difficulty. The other mental faculties, memory, etc., were intact, and the patient was just as much interested in his business as ever.

The visual fields were complete, and color perception good. During this test, which lasted about fifteen minutes, he showed only ordinary signs of fatigue, and there was manifested no inability to continue this mental exertion, as had been noticed in the attempt to read.

Being unacquainted with the literature of Berlin's report, the character of the visual disturbance remained doubtful to me. However, taking this in connection with the previous eclamptic attacks, I could but agree with the attending physicians, who considered the disturbances to be dependent upon some cerebral affection.

The further history did not throw any more light upon the subject. No history of hereditary trouble, previous illness, specific disease, or alcoholic excess could be obtained. Patient came from a healthy family, and was the father of three healthy children.

Fourteen years ago the patient had a sudden eclamptic attack, similar in all respects to the one just observed. This passed away with transient disturbance of consciousness, and left, with the exception of a tired feeling for twenty-four hours, no further ill effects.

During the last six months the patient's wife first noticed a change in his manner, which she attributed to anxiety concerning his business. He became rather restless, avoided his family, and his sleep was not sound and troubled with unpleasant dreams. The dreams were always connected with business matters, though his affairs were prosperous.

Though the patient was a painter, he had never suffered from lead poisoning—in fact he very seldom handled lead colors.

From these facts it was impossible to make an exact diagnosis, but I agreed with his physicians in ordering tonic treatment.

About the middle of July the patient felt so strong and well that he not only undertook long walks daily, but also mountain climbing, and after three weeks returned, apparently completely well. Only the inability to read remained.

Shortly after his return, on August 2d, an acute gastro-enteritis set in, without any assignable cause, and he was confined to bed. Patient complained much of headache, which extended over the whole skull, general uneasiness, and drowsiness. The intestinal catarrh passed away without the appearance of any other symptom. The fundus oculi and patellar reflex remained normal.

No attempts to read were now made, and mental effort seemed unpleasant to the patient, though he answered correctly all questions put to him. Memory and speech were still not impaired.

Patient now gradually sank into a soporous condition, in which he lay quiet, generally snoring. He participated but seldom in the general conversation, and questions regarding his business had no more interest for him. He complained of headache, which was not increased by pressure. There was no paralysis nor loss of sensation. The pupil of the left eye was somewhat dilated, but it reacted normally. Pulse was 60 and temperature 37.4.°

Revulsive treatment, seton in the back of the neck, and cold shower baths (the patient being still able to dress and undress himself) had no effect.

The soporous condition increased till August 15th, when the first symptom of paralysis showed itself in a retention of urine, rendering the introduction of a catheter necessary.

Even now during waking moments the patient's mental faculties were preserved ; though he complained incessantly of headaches. There was still no change in the fundus oculi.

On the morning of August 18th paresis of the facial muscles and the extremities of the right side was noticed, while æsthesia remained intact in all parts of the body. By the next morning the functions of the facial muscles and those of the extremities were completely restored.

Speech was now sluggish and one had to call loudly in order to obtain any answer from the patient, though he invariably replied correctly. The tongue was projected symmetrically.

The patient slept almost continuously, and indicated by a frequent deep groan that he still suffered from headache. The respiration now and then exhibited Stokes' phonemenon. Although there was no difficulty in swallowing, the patient only took nourishment when it was put into his mouth. This condition continued for two days without any further symptoms of paralysis.

Death followed in the evening of August 21st, in deep sopor.

Autopsy was made 15 hours after death. The skull-cap was of normal thickness, and the dura mater was in one spot so adherent to the left parietal bone that it required some force to detach it.

There was no difference in the fulness of the blood-vessels of the two sides, and only moderate venous stasis.

The gyri were normally developed, and there was no flattening nor pathological change at the spot where the dura showed the chronic inflammatory process.

The brain substance was of normal consistency ; the left ventricle contained no great amount of fluid. The locus affectionis was indicated by a discoloration of the parts in and around the corpus striatum.

Upon making a section through this region, which, especially in its anterior portion, was in a condition of softening, it was found to be occupied by three apoplectic foci, each in a varying stage of transformation, according to date of origin.

The largest focus, about the size of a walnut, and situated in the anterior portion of the corpus striatum, was surrounded by a delicate sheath of connective tissue. All the white substance which extended anteriorly to the inferior frontal involution, was involved, the whole mass being in a state of yellow softening—almost liquid. No arrangement of the original histological elements could be recognized. The gray matter was not at all involved ; and the cortex overlying this focus presented no pronounced bulging nor depression.

The second focus, situated at the upper and posterior border of the first, was of smaller dimensions (about the size of the kernel of a hazel-nut), and its consistence and colors indicated a more recent origin. It was also surrounded by a well-marked capsule. Only the white substance of the corpus striatum was involved to any extent, though there was a bulging of the inner nuclear masses from lateral pressure, and the capsula interna was pushed downward and inward. The focus showed macro- and microscopically the characteristics of red softening, and here and there in the mass were noticed single dark red spots of coagulated blood.

The third focus was evidently the most recent. It was about the size of a pea, occupied the middle of the nucleus lenticularis, and consisted of two fresh blood-clots which were under some pressure from the surrounding structures. The central portion of the nucleus was destroyed, and the surrounding tissues were œdematous.

The nucleus caudatus and the capsula interna were intact, with the exception of the displacement, though they had in general a somewhat reddish tinge.

The middle focus was traversed from below upward by a small dilated blood-vessel containing a thrombus. It was apparently a branch of the arteria lenticulo-striata, and could be peeled out of the softened mass like a solid structure.

The microscopical examination of the walls of this vessel, those of the choroidal plexus and one of the larger arterial trunks (carotid) showed no essentially pathological changes. Other parts of the brain (thalamus opticus, etc.) were normal, as were the right hemisphere and optic nerves.

Sections of other organs were not made; for repeated examinations had shown no lesion—not even in the heart.

To briefly summarize: we have a case of cerebral disease in a young and healthy individual, who, having lived under apparently normal conditions, and having been accustomed to bodily and mental activity, suddenly fell in an eclamptic attack while raising himself in bed after a good night's rest. The spasms having ceased, we next have a certain mental restlessness, which was first noticed during the last six months, and which could only be attributed to concern about business matters. Patient drank regularly, but with moderation.

This attack left behind no ill effects other than general weakness, soreness of limbs, headache, and certain tender spots over certain dorsal and cervical vertebræ. There was no failure of mental power.

Eight days later patient had another attack similar to the first, the spasms chiefly affecting the right upper extremity. It was now that the patient noticed his inability to read irrespective of the size and character of the type used. And whenever, as has been before mentioned, the patient made a mental effort, it was followed by a sort of syncopal attack preceded by a certain aura—a subjective sensation of smell. With this exception there was so far no symptom of cerebral disease.

Six weeks after the first attack the patient was much weakened by an acute gastro-intestinal catarrh. He was now drowsy and complained much of headache.

The first symptom of paralysis appeared in the bladder eight days before death ; and five days later it was followed by a transient paresis of the facial muscles and the extremities of the right side. At no time was there any loss of sensation. A few days later the patient died in deep sopor.

The probable diagnosis of a cerebral affection—made in the beginning from the disturbance in the reading faculty—had now become more certain as the disease progressed, chiefly from the right hemiparesis. It also seemed probable that the left hemisphere was the seat of the lesion. A more exact statement concerning the localization and character of the disease—whether circumscribed inflammation, infarct, or apoplexy—could not yet be made. The age of the patient, the normal sphygmographic tracings of the peripheral vessels, and the lack of any appreciable sign of atheromatous changes in the superficial arteries of the head seemed to speak against the latter. Therefore the theory of a circumscribed inflammation seemed the most plausible. The autopsy soon settled the matter by revealing three apoplectic foci located in and around the corpus striatum of the left hemisphere.

According to their situation and varying stage of transformation they were evidently in causal connection with the three separate attacks and, in like manner, with the characteristic disturbance in reading.

The first, most anterior and external focus, which showed already marked signs of yellow softening, stands in decidedly causal relation, according to time of origin, with the sudden eclamptic attack which occurred eight weeks before death.

It is to be noted that the seizure took place when the upper portion of the body was raised from the recumbent position while the head was at the same time turned towards the left. By this position the jugular vein of the left side is naturally compressed and the return of blood from that side of the head prevented. Now if the vessel-walls had lost their normal elasticity a rupture would easily occur.

After the convulsions ceased no evil results were observed since no parts of the brain presiding over important functions were destroyed, except the anterior portion of the corpus striatum and that portion of the white substance lying in front of it.

The convulsions which occurred eight days later were evidently caused by the second focus, lying above and to the outer side of the first. Here the transformation of the blood-clot was less far advanced, and exhibited the characteristics of red and not yellow softening.

The effect of this focus was felt not so much in a direct destruction of any important part of the brain as by pressure upon adjacent parts. Its origin was accompanied with a more severe headache and the peculiar disturbance in reading. The posterior portion of the left inferior frontal (Broca's) convolution, generally conceded to be the centre of speech, was not at all involved, while the subcortical white substance of this region was extensively destroyed.

There was at no time during the course of the disease amnesic or ataxic aphasia, agraphia, or a loss of the ability to understand spoken language. There was merely a want of ability in the brain to conceive and produce in language the pictures of words and letters as painted by the eye.

So we must suppose the existence of a mental æsthenia —a diminution of strength,—which depended upon a disturbance of nutrition in the organic parts of the brain presiding over the function of reading.

From observations of other cerebral affections, in which there was a disturbance in the reading faculty, we have been led to suppose the existence of an organic connection, more or less close, with the centre of speech. So we will not err greatly if we make responsible for the above-mentioned symptom that part of the brain occupied by the patch of yellow softening and affected by pressure of the second focus.

The transient paresis, occurring three days before death, was in all probability due to the recent effusion of blood into the nucleus lenticularis. This effect was only felt for a short time, for the paresis disappeared as soon as the parts around the lenticular nucleus became adapted to the pressure.

This group of symptoms agrees altogether with the well-known picture of affections of the nucleus lenticularis, where foci of a moderate size are accompanied by motor paralysis. As was before stated, this paresis lasted only one day, death occurring a few days later while the patient was in a soporous condition.

Since the literature of this subject, with the exception of Berlin's report, is wanting, I hope I will be pardoned for a somewhat detailed description. Moreover, I hope to show how important it is, as regards both diagnosis and prognosis, for the ophthalmologist to be familiar with this symptom.

And now I wish to add only a few words concerning the term "dyslexia" itself.

This mixtum compositum of Greek-Latin origin could much better, according to my opinion, be substituted by a word taken entirely from the Greek, since it is formed in imitation of the word "alexia," which is etymologically just as incorrect. It is composed of the Greek prefix, δυς, and the Latin legere; λεξις, in Greek meaning speech, language. For practical reasons, words composed from an ancient language are preferable, on account of the easier international understanding of their meaning. But I see no reason why we should allow the continuance of a mistake elsewhere made.

Why should we not substitute for it the word "dysanagnosia," which is taken entirely from the Greek, and is perfectly distinctive? To the uneducated this word will, of course, also present difficulties, but when it is once understood there will be no further trouble.

Indeed, by this addition we introduce an idea hitherto unknown to our pathological experience, and we have a term that at least need not be ashamed of its hybrid origin.

A CASE OF ZONULAR CATARACT IN AN ADULT WITH EXTRACTION AND MICROSCOPIC EXAMINATION.

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ON account of the rare opportunity to obtain suitable material, our knowledge of the minute anatomical conditions present in zonular cataract, is very limited. Deutschmann, *Arch. f. Ophthal.*,[1] was the first to report the results of a microscopical examination of a zonular cataract. The difficulty of obtaining a microscopical examination of a cataract so often met with, is due to the fact that if an operation is undertaken it is by discission, or the optical defect is in part overcome by an iridectomy, the use of a mvdriatic, or by fitting glasses. Extraction of the complete lens seldom occurs, nor does it often happen that one can secure after death an eye which contains a zonular cataract. Von Gräfe[2] examined four lenses which he extracted by the flap operation in preference to making discission, from patients advanced in years. He utilized these specimens to confirm the observations first made by E. Jäger[3] and later by direct observation by himself. Von Gräfe determined the fact—as shown in a transverse section of a dried lens—that the defect in zonular cataract consisted of an opaque whitish line ($\frac{1}{3}$ to $\frac{1}{2}$ *mm* thick) which separates a transparent cortex from a transparent nucleus. No microscopical examination is reported. To Zehender, Matthiessen, and Jacobson belong two cases which were utilized by them, as will be seen further on, to determine the coefficient of refraction of the differenr layers. Deutschmann improved an opportunity to examine a zonular cataract contained in a globe which was enucleated after death. The author's is the second case examined microscopically.

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[1] Pathologisch-anatomische Untersuchung eines menschlichen Schichtstaares, *v. Gräfe's Archiv*, vol. xxxii., 2, p. 295.

[2] *Archiv f. Ophth.*, vol. i., 2, p. 236. Ueber den Schichtstaar.

[3] Staar und Staaroperationen, 1854, p. 17. "Staarform mit isolirter Faserschichttrüburg."

During the winter just past Prof. Schweigger extracted a zonular cataract and kindly placed the specimen at my disposal. I here wish to express my thanks to Prof. Schweigger for the privilege of examining the specimen, also to thank Prof. Becker, of Heidelberg, for his kindly assistance in making the microscopical examination.

The history of the case is as follows.

G. Kothe, 50 years old, presented himself to v. Gräfe in 1862. Zonular cataract, which occasioned great reduction in vision, was present in both eyes. The cataract in the right eye was operated on by repeated discissions. Absorption of the lens substance was well advanced when the patient had an attack of granular conjunctivitis; at about the same time ulcerative amygdalitis, furunculosis, a general skin eruption, and marked depression of the general health supervened. Severe iritis followed with the appearance of pus first in the anterior then in the posterior part of the globe. The result was phthisis bulbi followed by enucleation. On account of the above process in the right an iridectomy was made in the left eye instead of discission.

After the iridectomy the patient was able to see near objects very well, distant objects were less distinct; however, his vision was good enough to enable him to resume his work. Since early in 1886, the patient's vision has been failing, this being manifested by the blurring and distortion of images and by double vision. This annoyed him to such an extent that on December 17, '86, he was obliged to give up his situation and to stop work. At his request the lens was extracted.

Status: Coloboma of the iris downward and inward. Oblique illumination shows the nucleus of the lens to be inclosed in a grayish evenly opaque layer which lies nearer the periphery than the centre of the lens. The posterior concave can be readily seen through the anterior convex layer, giving the impression of the presence of a clear nucleus. The cortical layers of lens substance are transparent. The equatorial border of the lens can easily be seen through the coloboma. By reflected light the centre of the lens appears darker than the surrounding red field, but is not completely opaque ; it permits the passage of a little light, and is grayish-red in appearance.

Vision : $S = \frac{1}{12} - \frac{1}{9}$; 0.4 at 6 *cm* with difficulty. With stenopaic slit $S = \frac{1}{5}$, not improved with glasses.

The teeth are of the rhachitic type. Patient first learned to walk at the age of four years. In the operation for extraction an incision was made with a small knife into the sclerotic opposite the coloboma. After a peripherical capsulotomy the lens was removed with difficulty, much of the soft cortical substance being stripped off. Pupil black. The wound healed favorably, but two discissions were necessary to clean the pupil of the remnants of lens matter and capsule. The patient obtained good vision ($S = \frac{6}{12}$).

The freshly extracted lens presented a very instructive appearance. The transparent cortex was very slightly hazy ; between it and the nucleus the opaque zone appeared as a very thin uniform layer of a now more yellowish color. In this opaque zone the structure of the lens was beautifully shown. On one side three narrow grayish stripes radiated from the centre toward the equator, and shorter rays branched off on either side like the rays of a feather. On the opposite side a large number of stripes ran from the periphery towards the centre, uniting in pairs before the centres were reached, forming many sectors, of which four were well marked. Inside of this zone lay the apparently clear, transparent nucleus. The lens was placed in 60 % alcohol, which was gradually changed to absolute alcohol. After remaining eight days in absolute alcohol, the lens was embedded in celloidin, and transverse sections were made by use of the microtome. Some of the specimens were examined in glycerine without staining, others were examined after staining with Lugol's solution, alum carmine, and hæmatoxyline.

In the sections the cataractous zone appeared as an oval band (Fig. 1). The long diameter of the oval in a central section was

6 *mm*, transverse diameter 2.1 *mm*, while the same measurements for the extracted lens, without the capsule and extreme outer cortical layers, were 7.3 and 3 *mm*. The cataractous zone itself varies in width from 0.016 to 0.08 *mm*, being narrower than that described by v. Gräfe[1] ($\frac{1}{3}$—$\frac{1}{2}$ *mm*) and Rydel[2] ($\frac{1}{6}'''$—$\frac{1}{4}'''$ = 0.36—0.54 *mm*).

On one side of the oval, probably corresponding with the posterior portion of the lens, the convexity of the cataractous zone is greater than on the other (Fig. 1, below). Under the microscope the cataractous band loses its continuous appearance: if we trace the band from the anterior around to the posterior portion of the lens (Fig. 1 *c*), it appears to be broken at the equator, the anterior part overlapping the posterior, as though the posterior portion of the cataractous zone occupied a layer of lens substance nearer to the centre of the latter (Fig. 1 *d*). Outside of the posterior, corresponding to a continuation of the anterior zone, single short lines are to be seen, which, if united, would form a continuous band with the outer zone. In the same manner the inner zone (posterior portion) is represented by single lines on the posterior side of the anterior band. The zonular cataract in this case is therefore double, being composed of two incomplete zones, the outer zone represented by the anterior band, the inner zone by the posterior band. These zones run together in places; in places are separated by unchanged lens tissue. The union of the two zones through short transverse bands is most noticeable in the anterior portion of the lens. Outside of both of the principal zones single small lines may be seen which may be considered as indicating a third zone. Small, opaque, parallel stripes also appear in the cortical layers, being larger and most plentiful at the equator. This resembles the early appearance of senile cataract (Fig. 1 *e*). At the poles this condition is also pronounced (*f*); nothing of this kind, however, is seen in the nucleus.

More highly magnified, the inner as well as the outer zone appears to consist of one or more fissures, which run parallel to the surface of the lens. These spaces are filled with granular masses, which, on account of their possessing an index of refraction lower than that of the normal lens tissue, produce the opacity. Greatly magnified, the contents of the fissures appear to be composed of large granules of quite uniform size. In this granular mass round, highly refractive bodies are scattered, which remain unchanged when treated with Lugol's solution or with sulphuric acid ; they possess a single contour, and are consequently to be considered as fat globules (Fig. 2 and 3). There is no appearance of cholesterine crystals or calcareous formation. Single lens fibres branching from the walls pass into and through the masses in many places, becoming again attached to the same side, or passing to the opposite side, dividing the principal fissures into many small parts. However, in general, each cataractous zone consists of one continuous fissure. The walls of the fissure throughout the greater part of its course (except on the side of the nucleus, the change in which will be mentioned hereafter) are composed of normal lens tissue ; the surface is smooth with but little appearance of degeneration. In some places the lens tissue in the outer wall shows granular infiltration. Teased preparations show that the lens fibres themselves, without being separated, have become thickened, and that their bodies are affected by granular degeneration (Fig. 3, *u*). This condition, however, is not very pronounced, the cataractous zone being mostly composed of the before-mentioned fissure formation.

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[1] *Arch. f. Ophth.*, Bd. i., 2, 5, 236.

[2] Stationaler Kernstaar oder Schichtstaar, *Wiener Medicinische Halle*, 1864, p. 70, etc.

The fact that the cataractous zones are formed by a separation of lamellæ of lens tissue, leaving a fissure between, is clearly shown by the examination of a transverse section (Fig. 2, *c*) where two layers of lens substance separate and become again united. The accidental fissures near the periphery are also formed in the same manner ; their contents being the same as are found in the principal fissures. External to the opaque fissures at the equator are other fissures, not filled with the granular mass. It is difficult to say whether these are artificial or existed before death and were filled with a clear liquid.

There are also numerous short fissures in the cortical layers, which differ from the above mentioned, also concentrically arranged. Near the surface these are plentiful and measure about 0.08 *mm* in length ; farther from the surface they are smaller and less numerous, measuring 0.04 *mm ;* farther back they are very small and few in number (0.008–0.012), as shown in Fig. 4, *o*. The last mentioned are so small that their contents cannot be determined ; the others are filled with a granular mass much finer than that found in the cataractous zone, and from which it may be easily differentiated. It is not certain that these fissures existed during life. The fact that they are found most numerous near the surface would indicate that their presence was due to some external influence, and it is very probable that the cause acted *post mortem.* They are to be distinguished from the spaces which Becker describes[1] as being present in the normal as well as in the cataractous lens, by their smallness, those mentioned by Becker measuring 0.35–0.6 *mm ;* also from the fissures, represented in the same work in the lower half of Fig. 24, Pl. v., which form between the layers of the lens in diabetic cataract by the absorption of water. The characteristic arrangement of the connecting fibres between the lamellæ is wanting, and the contents are not composed of drops, but of a uniformly coagulated granular mass.

The substance of the nucleus presents a peculiar appearance. It contains numerous distinct coagulated masses which appear to be post-mortem changes due to the action of the alcohol. This condition is not without interest, however, since it affects the entire nucleus, extending to the inner cataractous zone. Even with low magnifying powers (Fig. 1, *m*), the nucleus appears studded with small figures. Highly magnified, the figures appear long, spindle-shaped, or round, with sharply defined borders, their contents being slightly darker than the surrounding tissue in color, appearing something like nuclei. The substance of these masses appears to be homogeneous, but with the highest magnifying powers it is seen to be finely granular. They are from 0.008 to 0.002 *mm* in transverse diameter, and 0.013 to 0.075 *mm* in length, are not stained when treated with alum carmine, or hæmatoxylin, but are colored like the surrounding tissue when treated with Lugol's solution.

These masses appear to lie between the lens fibres, their longest diameter being parallel to them. In the sections through the centre of the lens the masses appear to be arranged concentrically ; many, however, do not follow this rule. Near the centre of the nucleus they are larger and longer, and are separated from one another ; in the neighborhood of the cataractous zone, smaller, more numerous, and irregular in shape, mostly round. In this peripherical portion of the nucleus the contour of the lens fibre layers cannot be made out, so that the relation of the masses to the lens fibres could not be determined.

A section in the principal axis of the lens, midway between the centre of the lens and the cataractous zone, is represented in Fig. 5 greatly magnified. We can here trace the same lamellæ for some distance. The masses above described are met with throughout their entire length. They possess irregular outlines, as though they had become lobulated during the process of coagulation ; they terminate in thin processes or are rounded off at one or both ends. The relation they hold to the tissue in the periphery of the nucleus is shown in Figs. 2, 3, and 4 ; as before mentioned, it is indefinite.

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[1] "Zur Anatomie der gesunden und kranken Linse," Wiesbaden, 1883, S. 33.

When these masses are isolated by teasing they are found to possess a contour of their own, and when broken across appear to be made up of a fine granular mass.

Although it is not possible to prove that the masses under consideration did not exist *ante mortem*, we may reasonably consider them the result of the hardening process, as, so far as I am aware, this condition does not appear in cataractous lenses which have been hardened in Müller's fluid while in an immature senile cataract hardened in alcohol I have observed the same condition. It is probable that had they existed in such large numbers during life, they would have produced an opacity of the nucleus which could have been determined through the cataractous zone. From what we have seen, the supposition becomes very strong that there must have been a chemical change in the substance of the nucleus before death, since the cortex remains free from these masses. If we admit a chemical change in the nucleus during life, it is plausible to refer this change to a period before the cortex was formed. It is not otherwise possible to explain how the cortex remains normal while the nucleus, equally normal at first, is affected by the degenerative change. It cannot be held that the previously formed cataractous zones, by interference with the nutritive current, could produce these isolated changes in the nucleus, since not the outer but the inner cataractous zone marks the dividing line between normal and changed lens substance ; the tissue between the rings is devoid of these changes. This change cannot therefore be due to mechanical interference with the nutrition to the part.

The morphological and chemical structure of the nucleus, studied carefully in a lens obtained directly after death, would certainly be of great interest. It is apparent that any change noted in so delicate a structure as the lens should be substantiated by examination in the fresh state. The fresh nucleus was not examined in this case,as no change was supposed to exist in it, and, in order to preserve the topographical relations, it was necessary to harden it at once.

In endeavoring to determine the manner of the production of zonular cataract from the conditions found, we may also have recourse to the existing theories in regard to the matter. According to Arlt and Rydel[1] an opacity of an outer layer is produced by the friction of a hard nucleus against a soft cortex during violent motion of the child while in a spasm. According to Horner and Davidsen,[2] a pathological layer of lens substance is deposited about a normal nucleus, analogous to the developmental anomalies in the teeth, due to a disturbance in nutrition in rhachitis. Leber[3] would modify the opinion by holding that the normally formed layer became changed subsequently.

According to these views it must be assumed that in this case both cataractous zones, possibly also the zone between them,were effected by the degenerative process, either during or shortly after their formation. This is at variance with our opinion, since the condition present does not appear to consist of an opaque layer of lens tissue, but of fissures between lamellæ of lens fibres. This view is in part substantiated by the observations of Förster,[4] who describes the beginning of senile cataract in the cortex of the nucleus as consisting of fissures between concentric lens-fibre layers, the fissures being filled with a granular substance. They have been already described in like manner by Becker in *Gräfe-Saemisch*,[5] and later in his work "Zur Anatomie der gesunden und kranken Linse." The cause given by these authors is uneven contraction of the peripherical fibres and layers which separate them forming fissures. An abnormal amount of the fluid portion of the lens collects in these fissures. The index of refraction, at first alike in all of the elements concerned, now becomes changed in the stagnant contents of the fissures, producing opacities. An abnormal process of diffusion is set up, by which the lens fibres lose a portion of their substance and absorb a portion of the contents of the fissures. A disturbance in the nutrition of the parts is thus brought about, which leads to a change in the chemical composition of the lens fibres and in the liquid portion of the lens tissue.

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[1] Rydel: Ueber Schichtstaar, *Wiener Med. Halle*, 1864, p. 70, u. f.

[2] Jophus Davidsen: Zur Lehre vom Schichtstaar; Inaug-Dissert, Zurich, 1865.

[3] Kernstaarartige Trübung der Linse nach Verletzung ihrer Kapsel nebst Bemerkungen über die Entstehungsweise des stationären Kern-und Schichtstaars überhaupt.—*v. Gräfe's Arch.*, vol. xxvi., 1, S. 283.

[4] Zur pathologischen Anatomie der Cataract, *v. Gräfe's Arch.*, Bd. iii., 2, S. 191.

[5] Pathologie und Therapie des Linsensystems, Bd. v., S. 256; Wiesbaden 1883, S. 68.

Becker finds confirmation of these views in the report by Priestley Smith[1] of the examination of a lens showing a decrease in volume which presented the first stage of senile cataract, and was considered by him to be normal for that age.

In our case of zonular cataract, we find also fissure formation at the periphery of the nucleus; it is extensive, almost completely surrounding the nucleus. If from analogy we conclude that this condition is not the result of active separation, brought about by the expansion of a substance developed between the fibre layers, but was produced by a contraction of lens tissue, the change must have effected the whole nucleus.

The observation that the lens with zonular cataract is as a rule less in diameter than the normal lens, would argue in favor of the shrinking process; it may also be claimed that the disturbance of nutrition, which may have caused the change in the intermediate zone, would prevent development of the lens to the normal size. In mentioning the fact that the diameter of the lens in zonular cataract is less than in the normal lens, v. Gräfe[2] expressed the opinion that the decrease in diameter was due to *contraction of the nucleus included in the cataractous zone.* To this author must be credited the first observation of this condition. He observed typical zonular cataract in a child of three years. The nucleus was transparent, and there was no appreciable diminution in the size of the lens. After three months v. Gräfe found that, instead of the very slight opacity, the pupil was occupied by a yellowish-white (calcareous) capsule, which enclosed the nucleus. The lens was now smaller than before, the cortex perfectly transparent; no other change was observed. v. Gräfe further says that the shrinking is not dependent on the presence of calcareous deposits, but occurs when no chalk is present—as was the fact in our own case.

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[1] *Medical Times and Gazette*, Jan 20, 1888.

[2] *v. Gräfe's Archiv*, vol. iii., 2, S. 379.

If shrinking of the nucleus, as in v. Gräfe's case, can be determined as early as the third year of life, it is not assuming too much to conclude that the beginning of the shrinking process may be much earlier before the opaque zone has appeared. If then the presence of the opacity depends on the shrinking of the nucleus, cannot its first appearance depend on the same thing?—the lens, as a rule, become smaller than the normal before the opacity appears.

If, therefore, on account of the presence of the concentric fissure, the analogy with Becker's theory regarding the formation of senile cataract and, further, the observation of v. Gräfe regarding the shrinking of the nucleus, we admit the cause of zonular cataract, to be a contraction of the nucleus of the lens, this alteration in volume must have been occasioned by a chemical change in the tissue involved, brought about by some unknown degenerative agency connected with rhachitis, probably an interference with nutrition. Layers of lens substance formed subsequent to this period would remain unaffected. In fact, we find a marked difference between the nucleus and cortical layers. In the first, scattered throughout its whole substance, we find the coagulation masses mentioned above, from which we must conclude that the nucleus, at a period before the formation of the cortex, underwent a chemical change.

Further, it is stated by Zehender, Matthiessen, and Jacobson [1] that the nucleus of zonular cataract possesses an abnormally high index of refraction, which does not agree with that of the nucleus of other individuals of the same age. In two cases examined, the following was found:

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[1] Zehender and Matthiessen: Ueber die Brechungscoëfficienten cataractöser Linsensubstanz, *Zehender's klin. Monatsbl.*, vol. xv., p. 239. Zehender, Matthiessen, and Jacobson: Ueber die Brechungscoëfficienten und die chemische Beschaffenheit cataractöser Linsensubstanz. *Ibid.*, p. 311 und vol. xvii., p. 307.

	Boy of 5 years.	Boy of 11 years.	Normal transparent lens of young person.
Cortex	1.4099	1.4194	1.3867
Outer nuclear layers		1.4234	1.4043 to 1.4154
Middle nuclear layers	1.4180	1.4344[1]	
Inner nuclear layers	1.4187	1.4253	

The above authors claim that with a change in the coëfficient of refraction of the cataractous lens there is a change in the quality of the badly nourished lens substance,—the case in the nucleus of zonular cataract. The fact may also here be mentioned that v. Gräfe[2] has observed that the nucleus in these cases is harder than in the normal lens.

The contraction due to the chemical alteration in the nucleus would naturally be the first step in the development of the circular fissure if surrounded by a capsule that is no longer elastic, as, for instance, a subsequent formation of cortical lens tissue which has not been subject to the injurious influence which affected the nucleus. The formation of the new transparent lens tissue was directly observed by Leber[3] in a young rabbit, in which traumatic cataract was induced. By subsequent development a perfectly clear layer of lens fibres formed enclosing the opaque mass. Similar to this is an earlier case reported by Becker[4] of nuclear or zonular cataract which was caused by a perforating ulcer of the cornea.

The formation of the second, outer cataractous zone can be attributed to nothing but the continuation of the same injurious cause, since the lens tissue between the two layers, does not show the change present in the nucleus. It may be well to state that it is not absolutely certain that the layers of lens substance formed later are inelastic. It is probable that the first cortical layer, after the formation of the first fissure, contracted a little in this way, leading to the formation of the second fissure. The separation and degeneration of the neighboring lens fibres is to be regarded as a secondary process. Von Gräfe's case goes to substantiate the conclusion that the process of contraction continues for some time,—for years in some cases; also the fact that zonular cataract is often overlooked in early life, and, in later years, on account of an increase in the opacities, probably due to widening of the fissure, is recognized. Perhaps the increase in the opacity of the lens in the adult reported by Leber [1] may be referred to the same cause.

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[1] The opaque zone.

[2] *Arch. f. Ophth.*, vol. i., 1, p. 256.

[3] *Cf.* above.

[4] Cataracta capsularis centralis ant., with cataracta nuclearis. Bericht über die Augenklinik der Wiener Universität, 1863–1865. Wien, 1867.

We must await more extensive observation before we can determine the general significance of the anatomical conditions found in our case. If we compare this with the case reported by Deutschmann, it is to be noticed that in his case the nucleus appeared clear and unchanged. This confirms our opinion that the coagulation products in our case were of post-mortem origin, but does not disturb the opinion that the nuclear substance had undergone a chemical change shortly before the formation of the cataractous zone without having first produced a noticeable optical defect.

Then also in the production of senile cataract there is a diminution in volume—a contraction depending on a previous chemical change, noticeable in the earliest stage (Priestley Smith). The fissure formation is brought about by the contraction of this tissue, which shows changes when examined either by reflected light or by the microscope, but which might easily pass for "normal."

It is further noticed that as a rule the nucleus appears to be clear when viewed through the cataractous zone, but at times opacities can be determined even under these conditions. v. Gräfe [2] speaks of a "no longer entirely transparent" nucleus, and further says that soon after the deposition of calcareous material in the cataractous zone the nucleus becomes opaque, shrinks, and also becomes calcareous.

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[1] *Cf.* above, S. 292.

[2] *v. Gräfe's Archiv*, vol. iii., 2. p. 380.

Deutschmann describes the cataractous zone as follows: In unteased preparations the lens fibres appear intact, their contents being changed by the presence of numerous vacuoles and very small myeline drops. In some places fissures and openings between the fibres are found which are filled with granular highly refractive detritus, resembling oil globules and small myeline drops. Teased preparations of this part show that this conjecture is correct. The larger portion of the lens fibres are preserved as such, but their edges are notched and very irregular; their contents hyaline in character, containing numerous vacuoles and coagulated myeline granules. In isolated places small fibres are seen, which are varicose, unusually granular, and broken. Between the fibres, highly refractive granular masses, intermingled with large coagulated myeline drops, are seen.

A second outer, not completely opaque, layer consists of very fine granular detritus and myeline drops; the lens fibres in the immediate vicinity are separated by numerous small fissures, and are embedded in detritus. It was possible to isolate lens fibres from those opaque masses; they appeared as small, highly refractive bands, showing numerous vacuoles, coagulated myeline drops, etc.

It appears, from the above, that here also fissures existed in the lens substance, in which detritus accumulated; these appear to have formed the most part of the outer zone, but not to have reached such a degree of development in the inner zone as appeared in our case. The degeneration of lens fibres was more marked. In general, however, the two cases resemble each other, and there is nothing in Deutschmann's case to militate against the idea that the formation of fissures was the primary, and the degeneration of lens fibres a secondary condition.

In conclusion we may summarize as follows: Scattered throughout the nucleus of the cataract examined, we find numerous small masses, which are apparently post-mortem coagulation products. This nucleus is surrounded by two oval zones of cataractous substance, neither complete nor continuous, which are separated by a layer of normal lens tissue. These zones are, however, united here and there.

Both zones consist in greater part of large and small fissures, which are filled with detritus. In their immediate vicinity lens fibres are formed, which are in process of cataractous degeneration. The cortex is composed of normal lens tissue, but presents a number of small fissures, apparently accidental, which are filled with detritus, and at the periphery a number of small fissures may be seen, which were apparently produced artificially.

Considering the conditions found, we conclude—analogous to the conclusions of Becker regarding the formation of senile cataract—that a chemical alteration in the subsequent nucleus, brought about by a change in the nutrition of the part, attending rhachitis, is the primary factor. This change takes place when the subsequent nucleus forms the entire lens and is followed by a general contraction of the affected part, which causes the formation of fissures between this part and the normally developed, unaffected, cortical layers of lens substance that are formed later. A granular deposit takes place in the tissue plasma collected in the fissures, and at the same time the neighboring lens fibres take on a form of granular degeneration. The partly formed fissures found in the cortex are probably due to contraction of the tissue occurring in later years.

These conclusions may be further substantiated by the analogy between zonular and senile cataract established by Förster[1] in his investigations on the pathology of senile cataract, the difference of course being that in zonular cataract the injurious influence affects the substance of a partly developed lens only, the portion formed later remaining unimpaired. In opposition to our view, that the whole mass of the lens developed up to a certain period undergoes a chemical change, is the theory that zonular cataract is formed by the deposition of a layer of pathological tissue about a normal nucleus, or that a normally formed cortical layer undergoes a pathological change subsequently.

Explanation of the Plates. (*Plate I. and II.*)

FIG. 1.—Drawing of entire section of lens, made with camera lucida and low magnifying power. Above, the anterior; below, the

more convex posterior, portion. *a*, Nucleus ; *b*, cortex ; *c*, outer zone of the double zonular cataract, at the equator and anteriorly ; *d*, inner zone ; *e*, accessory fissures with granular contents at the equator ; *f*, fissures of like nature near the poles ; *g*, artificial fissure in the middle of the opaque zone on the front side ; *h*, empty fissure in the cortex, probably artificial ; *i*, transverse fissure passing inward from the principal fissure ; *k*, transverse fissure passing outward into the cortex ; *l*, dividing lines between the lamellæ ; *m*, coagulation products in the nucleus. The same drawing holds for the following figures. *q*, Artificial parallel lines in the tissue, produced by the cutting process.

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[1] *v. Gräfe's Archiv*, vol. iii., 2, p. 197.

FIG. 2.—End of the outer cataractous zone at the equator, corresponding to a place above and to the left in Fig. 1. Zeiss Oc. 3, Homog. immers. $\frac{1}{12}$, 695 diam. Both cataractous zones appear here as single fissures filled with finely granular masses and drops of fat.

FIG. 3.—Degeneration of the lens tissue, a little to the outer side of the single fissure at the inner cataractous zone. Lens fibres studded with molecular masses (*n*). Zeiss Oc. 3, Obj. D. D., 320 diam.

FIG. 4.—Principal fissure of the zonular cataract with lateral transverse fissures, corresponding to the place indicated by "*i*" in Fig. 1. Artificial lumen in the middle. Outer zone (*c*) complete, inner (*d*) incomplete ; *o*, very small apparently post-mortem fissures in the cortex. Zeiss Oc. 2, Obj. C., 145 diam.

FIG. 5.—Coagulated secretion between the lens-fibre layers of the nucleus. Zeiss Oc. 4, Homog. immers. $\frac{1}{12}$, 950 diam.

CONTRIBUTION TO THE HISTORY OF CASES OF AFFECTIONS OF THE EYE RESULTING FROM LIGHTNING STROKE.

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Translated by DR. J. H. SHORTER.

THE number of cases of eye trouble, resulting from stroke of lightning, which have been thus far observed, is quite limited.

Leber[1] collected eighteen cases, and one each was reported by Purtscher,[2] Pagenstecker,[3] Laker,[4] Vossius[5] Meyhöfer,[6] and Uhl.[7] The last of which was associated with anæmia of the optic nerve, and deserves mention on account of the satisfactory therapeutic effect obtained by inhalation of nitrite of amyl. Cataract was found in nine cases, from which we exclude the one of Vossius, in which the cataract may be regarded as not resulting directly from the lightning stroke, but as connected with the choroiditis. The remaining thirteen cases displayed the most varied pathological conditions, as optic neuritis, hemorrhages at the macula lutea, partial atrophy and anæmia of the optic nerve, rupture of the choroid, choroiditis, and remotio retinæ, accompanied frequently by ptosis, ophthalmoplegia, opacities of cornea, and intolerance of light.

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[1] *Gräfe's Arch.*, vol. xxviii., Sec. 4.
[2] *Gräfe's Arch.*, vol. xxix., Sec. 4.
[3] SCHWEIGGER AND KNAPP'S ARCH., vol. xiii.
[4] IBID., vol. xiv.
[5] *Berliner klin. Wochenschrift*, 1886, Nos. 19, 20.
[6] *Klin. Monatsblätt. f. Augenheilk.*, 1886, Sept.
[7] *Ibid.*

Concerning the nature of the cataracts: In five cases they were encountered in both eyes (Brisseau, Downar, Leber, Pagenstecker, Laker), and formations on one side only (Foye, Rivaud-Landreau, Servais, Meyhöfer); they were either stationary and partial, such as anterior polar, punctated and striped opacities of the anterior cortex, superficial opacities of the posterior cortex, opacities of the anterior and posterior capsules, or had a progressive character. Common to all, however was the fact that in no case did any spontaneous clearing up of the opaque parts of the lens set in.

Standing in contrast to this is a case which was brought to this clinic in the summer of 1886, treated for a time, and most carefully followed ophthalmoscopically. The clinical history is as follows:

Wilhelmina Schneider, three and a half years old, came to the Policlinic on May 26, 1886. The father stated that on the day previous there was a terrific storm at his home, during which his house was struck by a thunder-bolt, set fire to, and destroyed, the mother of the child killed, and the latter itself struck.

The more particular statement was to the effect that the mother and child were in the kitchen when the lightning descended the broad chimney which gave free communication with it; both were crushed to the ground, and dragged lifeless out of the burning house, but without any trace of a burn present on their persons. Attempts at resuscitation were fruitless in the case of the mother, but the child, on the contrary, after being treated for five hours with vinegar compresses to the head, came to again, but was very cross and fretful; kept the face depressed and the eyes spasmodically closed. Owing to this the father came on the next day to Berlin.

States May 26, 1886: Strong, stout, very uneasy child, with pretty blond hair; face and body free of any wound or burn; the hair not singed; no paralysis, so far as could be determined by the fact of child being able to run about the room, raise the arms quickly, etc. The eyes kept fast shut, even in a dark room; the lids slightly œdematous, without redness; cilia intact; palpebral conjunctiva somewhat hyperæmic, perhaps, however, also normal, and only hyperæmic in consequence of the forcible opening of the lids; marked pericorneal injection; around the cornea, a breadth of half a centimetre backwards, a partially transparent swelling of the bulbar conjunctiva, one millimetre in height, partially transparent, and of a glass-bead appearance. Towards the equator of the globe were visible on the normal conjunctiva and sclera only isolated injected superficial conjunctival blood-vessels.

The surface of the cornea intact, but in the substance of the cornea proper were uncommonly numerous faint gray-striped and punctated opacities, located especially in the external corneal layers, very delicate, but at the same time interfering to a high degree with the transparency. The deeper layer seemed to be unimpaired.

The anterior chamber of ordinary depth ; the aqueous humor apparently clear ; the pupils black, of equal size, reacting to light rather sluggishly ; the irides grayish-green. Whether the coloration was normal, or there had been a change of color, could not be determined with certainty, as both eyes presented the same picture. A hyperæmia of the iris may, however, be assumed, as the picture of its surface is not very sharp. The ophthalmoscopic examination was made under ether, and with the pupils dilated to the maximum by atropine. The lens showed no changes either by focal or transmitted light, although the image was not very sharp, owing to the corneal opacities ; absence of any vitreous opacities ; pupilla and macula lutea normal ; tension unaltered. The foregoing report applies to both eyes equally.

The examination took place at noon ; three hours later the child was playing about the station, running around, eating apples, etc., and in moderate light opened the eyes half-way. The whining voice has already in great measure disappeared, there are no signs of any psychic disturbance, and the vegetative functions leave nothing to be desired. The watch is recognized as such.

Ordered : Atropine, and compresses of lead water.

May 27th.—Very clear voice. Eyes opened even in the light. Lids still barely swollen. Ocular conjunctiva as it was yesterday. Only a hint of corneal opacity still remaining.

Examination made again under anæsthesia and with maximum dilatation of the pupils. Both by focal and transmitted light from a plane mirror there are seen in both lenses to the inner and lower part numerous (about fifteen) symmetrically situated, very delicate radial opacities, lying immediately under the capsule, and running forward almost to the anterior pole, which are so very fine as to be overlooked with the concave glass. The rest of the lens is clear. The lens capsule intact. On awakening from the anæsthetic, some photophobia and lachrymation.

May 29th.—The injection and swelling of the bulbar conjunctiva is much less. The eyes open well in the light. A few individual opacities still present in the cornea. The extremely delicate lenticular opacities are greater in the left eye than in the right.

June 1st.—Both eyes free of irritation. There being no annoyance, no further treatment was ordered.

June 3d.—Swelling of lids has subsided ; palpebral conjunctiva normal ; ocular conjunctiva no longer swollen ; here and there the superficial blood-vessels still injected. Cornea and aqueous entirely clear. Iris of a grayer tint, no longer changed in color ; pupils dilated, no synechiæ. In the lenses the delicate opacities have disappeared, but in place of them there has appeared in the last two days in both eyes symmetrically, downwards and outwards, about 2 to 3 *mm* distant from the corneal margin, an intensely grayish-white opacity about 1 *mm* broad to 2 or 3 *mm* long, lying directly under the anterior capsule, and of crescent shape, with the convexity turned towards the corneal margin, from which single, rudimentary, irregularly shaped little branches go off. That in the right is a little larger than in the left. Fundus is normal. The vision is good : a pin thrown on the floor is immediately picked up.

Patient was discharged, with instructions to report in three months.

Probably through lack of money and because the child kept well the father did not come, on which account I requested the family physician, W. Stieber, in April, 1887, that is eleven months after the occurrence of the mishap, to examine the child.

Without my specifying to him any more exactly the probable condition, he described the above-mentioned collections in both eyes, but found that the lenses were otherwise transparent, and that the child could see well. Thus there had been no change, and it may be expected that this condition will remain.

To summarize in brief : The lightning struck down the child, leaving it senseless, but without hitting it directly or producing any burn whatever. Five hours later it regained consciousness, with mind and body uninjured, with the exception of the eyes. The latter showed considerable intolerance of light, swelling and injection of the ocular conjunctiva, opacities of the corneæ, which disappeared in course of a few days, and lens opacities in both eyes, which were not diagnosed on the first day, though probably already present at that time, but not visible by reason of the opacities in the cornea. The very delicate opacities in the lens were recognized on the second day, disappeared after six days' duration, and left in their stead a denser one, which can still be seen. The eyes are otherwise perfectly sound.

The above-cited symptoms are among those which have been most frequently mentioned and carefully described in different earlier publications, so we can quickly pass over them at this time. It only remains to restrict ourselves to the consideration of the lens opacities, the disappearance of which in cases of cataract from lightning stroke have never yet been observed. Of other cases of cataract, in which a clearing up of the opaque lens substance took place, I can only recall, of late years, that of Landesberg,[1] in which case (one of traumatic cataract) a restoration of transparency of the lens took place in some weeks, with vision $= \frac{15}{15}$. The cases of Brettauer,[2] Newmann,[3] Lange,[4] stand on another grade, representing, as they do, not those of clearing up, but of resorption of cataractous lens masses in elderly persons, for which it required always a period of time of many years' duration; in Lange's case, thirteen years.

But it is not with such as these that we have to deal in the case of this child; here the opacities of the lens were genetic, and in their further course showed absolutely nothing in common with the former.

We assume with Leber that opacities arise in the lens in the manner of a catalysis, but in our patient we will make prominent the fact that we are not considering a case of opacity of the lens fibres, but of an opacity caused by coagulated albuminous masses external to them. Whether (as according to Deutschmann, Schwalbe[5]) there is found lying directly under the anterior lens capsule and between the epithelium and the lens fibres a subcapsular and subepithelial albuminous layer, or whether the space in which the latter is contained represents a cadaveric appearance (Becker)[1] and only demonstrates here the tissue fluids which are present in all tissues, cannot be discussed in this place. But this much is certain, that there is an albuminous liquid there, which naturally is liable to coagulate from various causes. We may conceive of the catalytic action of the electric flash as being one such cause, and must consider, perhaps, that not only is a coagulation produced by it, but that in addition a distention of the capillary space between the epithelium and the mass of lens fibres by delicate honeycomb formations, perhaps on account of liberation of water, whilst the coagulation product radiating correspondingly with the fibres of the lens, can accummulate at the anterior pole.

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[1] *Klin. Monatsbl. f. Augenheilk.*, Aug., 1886.
[2] Report of the Ophthalm. Congress of Heidelberg, 1885.
[3] ARCH. OF OPHTHALM., Schweigger and Knapp, vol. xiv.
[4] *Gräfe's Archiv*, vol. xxxii., Part 4.
[5] Schwalbe: "Lehrbuch der Anatomie der Sinnesorgaus," Erlangen, 1885.

Now this coagulum might become reabsorbed, or if remaining may undergo a change of position, both of which could have occurred in our case.

Regarding, as do Michel and Wagner,[2] the lentoglobulin and lentoalbumen as albumen bodies of the lens, of which we know that they coagulate, and in weak alkaline solution again dissolve, so it is nothing contrary to this to make the assertion that the coagulated albuminous bodies again passed over into a liquid condition under the influence of the alkalinity of the constantly circulating tissue fluids.

The disappearance of the opacities previously visible with the ophthalmoscope may be thus explained. The whitish-gray opacity which appeared on the sixth day and has until now remained stationary, might be described as a true capsular cataract (Becker), proceeding from some quite unknown alteration in the epithelial cells, although, self-evidently, it is not clear for what reason it should have appeared in each eye symmetrically. It may be probably connected with an affection of the nerve fibres.

On the other hand the view may be taken, that the albuminoid bodies are not reabsorbed, but are displaced by the current and heaped up by it in one place, where they act as irritating foreign bodies and thus cause the formation of the new appearance. As to this one might object, looking from the symmetrical position of the present opacity, that the fine opacities were getting scantier, before any thing of the capsular cataract was visible; that the nutritive current flows towards the anterior pole, and that from the relative position of the first and later opacities a confused whirl in the current must be assumed, whereby, however, it then still remains unexplained how the flakes in the end become all collected.

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[1] Becker: "Zur Anatomie der gesunden und kranken Linse," S. 37. Wiesbaden, 1885.

[2] Michel und Wagner: Physiol. Chem. Untersuchung des Agues, *v. Gräfe's Archiv*, Bd. xxxii., Abth. 2.

It seems to me not an acceptable opinion that an opacity of the lens fibres has been present, about in the sense of Knies, who regards cataractous degenerations as processes of the same character as the opaque swelling of Virchow, an idea which cannot be lightly set aside without further discussion for the reason that, up to the present, nothing certain is known regarding a resorption of lens albuminous, opaque fibres causing a disappearance of the opacity of the lens, but especially for the reason that we have seen from several observations, Lange, etc.,[1] that a resorption of cortical substance can take place only after a stage of complete liquefaction, sometimes with a subsequent spontaneous clearing up of the later masses, in favor of which Knapp[1] also has declared himself; but nothing of the kind was visible in the lens, and at all events the time of six days was absolutely insufficient for a metamorphosis of such a nature.

Unfortunately I was not able to get a view of the chemical changes brought about by catalysis. Some may say that it is like the curdling of milk in a storm. But here also there are difficulties lying in our way: for some claim that the ozone, or, as otherwise expressed, the active acid material changes direct the milk sugar of the milk into lactic acid and alcohol, and that the lactic acid causes precipitation of the caseine and albumen, while others state that through influence of the ozone the ferment suspended in the milk is favored in its vegetative development, and through the rapid growth of the same and the increased efficacy resulting therefrom, the above-mentioned chemical process is set up in the quickest time; others again combine both views and accept both the direct and indirect action of the ozone. But what the chemistry here in the lens is, where the ozone has to exert its action on two albuminous bodies suspended in an alkaline liquid, is a question in all cataracts from lightning stroke, but regarding which I have not been able to learn any thing from books or from experienced chemists.

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[1] Transactions of the Ophthalmological Society at Heidelberg, 1885, p. 57.

One must satisfy himself in this regard, as said above, simply by regarding the opacities as being produced in the manner of a catalysis.

CONTRIBUTION TO THE MAGNET OPERATION.

(From the Clinic of the late Prof. Horner of Zürich.)

By Dr. E. NEESE, of Kiew.

Translated by H. A. B. MacCauley, M.D., of New York.

ALTHOUGH the material so carefully collected by Hirschberg[1] covers the ground pretty thoroughly, it would seem to me that further discussion of the magnet operation is necessary, in order more exactly to formulate the indications for the procedure, as well as to shed more light upon the circumstances which render its execution difficult or even frustrate it entirely.

Through the kindness of the late lamented Prof. Horner, while spending a summer in Zürich, I was enabled to utilize a series of observations, embracing forty-two cases, beginning in 1880 and ending in 1885, at which time the academical career of the celebrated clinical teacher was brought to a close.

The presence of a fragment of iron in the eye, following a traumatism, having been verified, it is next of most importance practically to determine whether the foreign body is situated in front of or behind the posterior capsule of the lens. If in front of the posterior capsule, providing its proportions be such as to admit of the use of the magnet at all, the operation is quite easy. When, however, the foreign body is imbedded in the posterior region of the globe, the conditions are more difficult, and the result more doubtful. As regards the anterior chamber, the cases presented are simply additional examples of the advantageous operation of the magnet, as compared with simple mechanical extraction. When the posterior section of the eyeball is implicated, the magnet is then our only resource, but the results obtained, are by no means as satisfactory.

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[1] "Der Electro-Magnet in der Augenheilkunde." Leipzig, 1885.

I.—ANTERIOR SECTION OF THE GLOBE.

a.—Cornea.

The magnet, of course, is not brought in question in those cases where the splinter of iron has simply pierced the more superficial layers of the cornea. We must, however, fully agree with Hirschberg in thinking it indicated in cases where the foreign body lies so deeply imbedded in the cornea or sclerotic as not to be easily reached with mechanical instruments, or in cases where the piece of iron already projects into the anterior chamber, thus exposing us to the risk of shoving it into this space when the ordinary instruments are used. The case in point might be illustrated by several examples, as eight such are at our disposition. I choose, however, one amongst them as particularly instructive. Here the magnet was not used, and no result was obtained. The entrance wound was enlarged, but the foreign body was so deeply seated that it could not only not be seized with the forceps, but was pushed on into the iris. The anterior chamber was abolished, and an incision was then made with the lance-shaped knife, followed by iridectomy. The operation, however, was not successful, and the foreign body remained in the eye.

On the other hand, in another case (Käge), the small foreign body was firmly imbedded in the deeper layers of the cornea, and, after several unsuccessful attempts at mechanical extraction, was finally pushed into the anterior chamber. Here, however, after incision of the cornea with the lance-shaped knife, the offending fragment was removed with the magnet through the wound thus made without further trouble. (S = 1.)

In another case (Albert Schmid) attempts at removal of the foreign body from the deep corneal layers by freshening the wound and the use of the magnet were ineffectual. The lance was then pushed into the anterior chamber, and pressed against the posterior wall of the cornea, removal being meanwhile attempted with the spatula. At the critical moment of the perforation of the cornea, however, an involuntary movement of the lance almost allowed the foreign body to pass into the anterior chamber; this danger was averted by the timely use of the magnet, by means of which extraction was promptly effected. ($S = \frac{20}{50}$.)

When the foreign body is primarily deeply imbedded in the cornea, and projects far into the anterior chamber, its extraction may be undertaken directly from the latter, by introduction of the magnet through a lance incision.

Alb. Bratscher, twenty-three years old, while chopping wood a week ago, received a foreign body in the left eye. Attempts at extraction were made at other hands, but were without result. The foreign body is situated in the inner lower quadrant of the cornea, its point projecting into the anterior chamber. Attempts at extraction with the magnet were ineffectual, owing to the deep situation of the fragment. An incision was then made with the lance, at the inner border of the sclerotic, the knife passing in behind the foreign body as far as the border of the pupil. After withdrawal of the knife, the electro-magnet was passed into the wound until close to the foreign body, which was attracted by it and easily withdrawn. No prolapsus of the iris. Eserine. $S = 1$.

Our mode of procedure of course will be determined by the peculiarities of the case in question. In many cases where the splinter projects but slightly into the anterior chamber, it usually responds to the influence of the magnet held in front of the cornea, after removal of the superficial corneal layers, as demonstrated in Emil Meyer's case. In this patient the foreign body lay deep in the cornea, and could not be removed with the spatula. Hirschberg's case (Adam), where the point projected into the anterior chamber, is another of the same kind, as is also one mentioned by Kornstein of a foreign body piercing the cornea, but lying with the point directed forward, so that the forceps slipped off at each attempt to grasp it. The extraction was easily accomplished with the magnet, held in front of the cornea after removal of the superficial layers. The magnet seems also indispensable when fine hair-like splinters are lodged in the cornea (Hirschberg's sixth case).

b.—Anterior Chamber.

Only two cases of foreign bodies situated exclusively in the anterior chamber, are at our disposition. In one of them (Steinmeyer) a fragment of iron lay at the bottom of the anterior chamber, and was at once washed out by the aqueous humor, upon peripheral incision with Gräfe's knife. Here the magnet seems not to have been absolutely indispensable. Extraction was at any rate rendered easier by it, than it would have been without. S = 1. The magnet gave no result in the second case (Heinrich Schmid); the wound was therefore enlarged, and the splinter drawn out with a pair of fine forceps.

The first of these two cases offers very little evidence of the value of the magnet, the second none at all. Nevertheless we hold it to be of real importance for the anterior chamber, especially in cases where the foreign body is first seen after the incision of the cornea, there being a liability of its disappearance in such cases (as noted by Hirschberg) and consequent impossibility of extraction by the ordinary instruments. The use of more or less pointed instruments is also much more dangerous than when the blunt magnet is used, there being great danger of traumatism, especially of the capsule of the lens, as well as that of plunging into the vitreous. The forceps should of course be near at hand in all cases, as is illustrated by case number two. They are particularly useful when the foreign body is firmly hooked into the tissue.

c.—Iris.

In the six years (1880–1885), there were observed in all six cases of metallic foreign bodies firmly lodged in the iris. The magnet was indicated in only three of these, and in but two did it yield any result: Elise Schmid, where the foreign body lay near the inner border of the pupil; and

Lee, where it was located at the inferior outer periphery of the iris. In the third case (Schötteldreyer), excision of the iris, including the foreign body, a piece of gun-cap, had to be resorted to. The first of the remaining three cases (Blattner) was one in which the foreign body had remained in the eye for fifteen years without reaction. At a later period, however, repeated imflammation had culminated in exciting an iritis. The foreign body was situated upon the lower part of the left iris, and not yielding in the slightest degree to the influence of the magnet, final resort was had to iridectomy. In the second case the fragment of iron had been *in situ* for a week, and was covered with a yellowish fibro-purulent exudation. Upon incision with the lance and discharge of the aqueous humor, the offending body appeared in the wound, and was removed with the iris forceps. The iris was reduced with the probe. In the third and last case (Wächter), the foreign body was very firmly imbedded, and was cut out together with the iris. This agrees pretty well with Hirschberg' s results, where, in the most impartial manner, only one case of extraction by the magnet is reported against five others in which extraction had been accomplished by means of the forceps, before the time of the magnet; this, however, aided by excision of the iris.

It is thus seen that although the magnet is not effective in all iris cases, it is certainly indicated where the foreign body is not too firmly adherent, if only for the reason that injuries to the capsule, as well as excision of the iris, may thus possibly be avoided.

d.—Lens.

In three cases metallic foreign bodies were successfully extracted from the lens with the aid of the magnet:

In the first of these (Somini, twenty-seven years old) the offending body lay upon the posterior capsule, above and internal to the pupillary border. The next morning it had sunk about 3 *mm*, and was freely movable upon blinking the eyes. The lens is almost transparent as far as the wound of entrance in the anterior capsule. Ten days after, lower linear incision, iridectomy, introduction of the electro-magnet, and successful extraction of the fragment. The lens was then scooped out with the spoon.

Fingers at one foot, secondary cataract, discission, with $+\frac{1}{3\ 1\text{-}2}$ $S = \frac{20}{50}$.

In the second case (Wehrli, forty-three years old), a sharp-edged foreign body was likewise imbedded in the posterior capsule, surrounded by an opacity of the cortex. Great opacity of the lens, suppurative iritis, and hypopyon three weeks after. A broad lance incision made below, with iridectomy and introduction of the magnet, whereby a small splinter of iron was received. As much of the lens was removed as was possible under the circumstances. Fingers at 8 feet and with cataract glasses, $S = \frac{1}{20}$. A subsequent small discission will be necessary.

The foreign body in the third case (Schlatter, thirty-seven years), had bored through the middle of the lower lid, pierced the sclerotic at the inferior corneal periphery, cut through the iris, and found final lodgment in the upper part of the lens. The fragment was successfully extracted with the aid of the magnet. Final result : 12.0 D ; $S = \frac{1}{3}$. Complete absorption of the lens.

In another case the magnet was of use to a certain extent.

Melcher, twenty years old, while engaged in rivetting a boiler, received a flying splinter into the eye. The lens is characteristically opaque, and the foreign body, 2½ *mm* long by 1 *m* wide, is lodged in the lower part of it. Movements of the hand are seen, and perception of light and projection are good. Corneal incision, and the capsule opened with introduction of the magnet. The fragment was thereby drawn towards the wound, but its removal with the magnet alone was impossible, owing to the liability of its recession, upon the passage outward of the soft masses of the cataract. A fine pair of forceps was therefore passed into the wound, and the fragment successfully extracted. The lens was then completely removed.

With $+\frac{1}{2\frac{1}{4}}$ Snellen 1½

In another case however the action of the magnet was ineffectual.

Eichelberger, fifty years old. The foreign body entered the eye five days ago, and lies in the lens surrounded by a circumscribed opacity. The iris became implicated, and an abscess of the lens has formed in the neighborhood of the internal pupillary region. Owing to violent and continuous pain, an attempt at extraction was made in three weeks, although the lens was not yet ripe. Incision with the lance-shaped knife at lower inner margin. Iridectomy. Capsule opened and magnet thrust into the anterior chamber, but without result. The foreign body however was washed out with the cortical masses, into the conjunctival sac, whence it was easily withdrawn with the magnet. The nucleus was removed by causing the wound to gape, and the cortex emptied as far as possible by rubbing with Daviel's spoon. Injections of a solution of salicylic acid into anterior chamber. After secondary iridectomy S for fingers = 4 feet was attained.

These cases of implication of so important an organ as the lens are not numerous, and may seem insufficient to demonstrate the superiority of the magnet as compared with the simple mechanical traction instruments. Hirschberg himself cites only two such cases (one of which, where extraction was accomplished by the magnetized lance, is very striking), while he notes eight cases of completely successful extraction, without the aid of the magnet. The literature upon this subject, however, shows thirteen other cases in which foreign bodies were removed from the lens with the magnet, six by Snell, three by Little, two by Hansen Grut, and Samelsohn and Haase one each. In all these cases the operation was crowned with success, except in one of Little's patients, where the metallic fragment was imbedded in the anterior capsule, and finally had to be removed with the forceps. On the other hand, this latter instrument would have been of no use in one of Hansen Grut's cases, as the base of the foreign body was firmly fixed, likewise in the anterior capsule, with only its point projecting into the anterior chamber. Another instance is Haase's case. Here the splinter was so firmly implanted in the tissues of the iris and substance of the lens, that the forceps was preferred to the magnet, and the latter only tried after repeated ineffectual attempts at removal with the former, the smooth surface of the fragment offering no chance for fixation with the forceps. The curved end of the magnet was then applied to the wound, when the piece of iron darted to it, and was removed easily. In Samelsohn's case the magnet was used because the foreign body could not be definitely located.

Snell, in referring to his cases, says the extraction might have been effected without the aid of the magnet, but that owing to the small size of the splinter, it would have been difficult and unsafe.

From these observations it would seem that the magnet is especially adapted to the removal of foreign bodies from the lens, from the fact that its loose and swollen tissue on the one hand, offers very little mechanical resistance to the action of the magnet, while, on the other hand, it is easier to find the fragment in the cloudy mass, and there is less danger of penetration into the vitreous, than with the forceps.

Passing the results of our experience in review, it is seen that extraction of foreign bodies in the anterior section of the eye is usually successful, by one method or the other, with fairly good results as regards the sight.

The electro-magnet, in a certain number of cases, is seen to be not necessarily indispensable; in others it is positively contra-indicated; while in a third class it does not fulfil the end in view. Cases belonging to this latter category comprise those in which the foreign body is very firmly imbedded in the medium surrounding it. This is less likely to be the case, as above noted, when the lens is implicated, its opaque swollen substance offering, least of all, mechanical resistance to the action of the magnet. On the contrary, when imbedded in the deep layers of the cornea, the obstacles to extraction are much greater; by removal of the superficial lamellæ of the cornea, however, the foreign body is made accessible to the action of the magnet. When the foreign body is lodged in the iris or in the capsule of the lens, it is more likely to resist the magnetic influence. In such cases recourse is had, more frequently, to the forceps.

The use of the magnet depends upon the circumstances of the case: the smaller and more brittle the fragment, the smoother and finer it is; the lesser the degree of fixation in the tissues, the greater the indications for its use. At any rate it can do no harm, and often offers such decided advantages over the ordinary traction-instruments, as to more than compensate for the extra trouble attending its use.

II.—POSTERIOR SECTION OF THE GLOBE.

A permanent result—that is, as far as removal of the foreign body and preservation of the shape of the eye are concerned—was obtained in only five of the eighteen cases of foreign body behind the posterior capsule of the lens subjected to the action of the magnet. Power of vision was preserved in only two of these, namely: counting the fingers at a distance of one metre. In a third case (Weber) there seemed to be some probability of restoration of the sight, to a certain extent, but observation of the case was not continued. The history of these five cases, briefly, is as follows:

A.—Permanent Results.

a.—With Partial Vision.

1. Baumann. Foreign body flew into the eye the day before while hammering a piece of steel. Left corneal wound about 2 *mm* in size, opposite the nasal border of the pupil. Lens already shows extensive opacity implicating almost the entire posterior cortex, opposite the corneal wound. The wound in the capsule of the lens runs from above internally, downwards and outwards. When the eye is moved, the greatest opacity is downwards and inwards; here and there Horner thinks he sees "a gleam" through the lens. Operation twenty-four hours after traumatism, with anæsthetics. Incision with Beer's knife between the internal and inferior recti muscles. The straight, pointed magnet introduced in the region of the posterior pole of the lens, but without result. The wide, curved magnet was now applied and twisted around so as to reach the neighborhood of the ciliary body and posterior pole of the lens. Upon withdrawing the magnet slowly, a small piece of iron, 3 *mm* long (4 *mgrm*), was extracted. No loss of the vitreous whatever.

Two weeks after, the eyeball is without injection. Anterior chamber deeper than that of right; partial, very intense cataractous cloudiness. No specks in the vitreous. Fundus invisible. Tension normal. Fingers at two feet. Projection very good. Discharged. Final result three months after: *The opacity of the lens has decreased* and concentrated itself near the wound. *Optic nerve visible with ophthalmoscope.* Fingers at one metre.

2. Ahrens. Traumatism of the right eye by a flying splinter

of iron. Linear wound about 8 *mm* long, 1 *mm* external to the border of the cornea, passing backwards. Foreign body *lies exactly behind the lens*, is shiny and about 5-6 *mm* long by 2 *mm* wide. Operation at once (same day) with the magnet. The bent magnet passed through the wound and near to the foreign body (*which is at once attracted by it*), *and then slowly withdrawn, bringing the fragment, solidly attached to it, with it* (12.5 *mgrm*). Wound sutured.

Three weeks after: Diffuse opacity of the vitreous in the centre, with numerous blood coagula floating around. *Above and externally, detachment of the retina.* Fingers at one metre. Patient discharged.

Final result, five months after: *Partial opacity of lens. Retinal detachment outward and downward.*

3. Weber, seventeen years old. Foreign body flew into the eye while chiselling. Perpendicular corneal wound, 5 *mm* long, opposite the torn nasal border of the pupil. Lens very much swollen; greatest opacity posteriorly and externally. Magnet extraction the following day. The wound of entrance was reopened by a vertical incision and widened. After four attempts the foreign body is finally brought to light (8 *mgrm*). It was apparently situated to one side and down in the depths of the vitreous. Cicatrization without any sign of inflammation. Pupil reacts well with atropine. Numerous lens masses in the anterior chamber. Perception of light and projection excellent.

Although this case was not followed up, there is no doubt that a certain degree of visual power, together with preservation of the form of the globe, has been obtained.

b.—Without Vision.

4. Laubi, ten years old. Yesterday, while cutting potatoes, received a foreign body into the right eye. Central corneal wound. There is a hole in the iris, below, at the border of the pupil. *Slight hypopyon.* Posterior and anterior capsular wounds are visible. In the depths of the vitreous is seen an opaque mass, which shines here and there. Foreign body lies at the inner lower side, between the vertical and horizontal meridians.

Twenty-seven hours after, incision with the linear knife at the inner side at R inferior, after first dividing the conjunctiva. After repeated introduction of magnet, foreign body is removed (2.5 *mgrm*). Catgut sutures.

Two days after: Depths of eye show a yellowish coloration. Copious purulent pupillary exudation. The wound in the lens is considerably infiltrated and yellow. Discharged in three weeks. Final result, six weeks after: Phthisis bulbi; occlusion of pupil; deep anterior chamber; amaurosis.

5. Surbeck, nineteen years old. Received foreign body into right eye while chopping. Corneal wound crosses the centre, a little under and somewhat external to it. Iris very much discolored; hypopyon. Conjunctiva of both the eyeballs, and lid already œdematous. The next day, incision of the sclerotic with Beer's knife between the internus and superior recti muscles. Introduction of magnet. Fragment of iron extracted upon the second trial (5.5 *mgrm*).

Following day: Chemosis, but not marked; painful; subsequently decreases gradually.

Discharged three weeks after. Eye movable.

In all of these five cases the operation was executed under relatively favorable circumstances, not later than the day following the traumatism in any case. The foreign bodies were small, the weight of the largest being only 12.5 *mgrm;* they were situated in the anterior section of the vitreous, the path leading to them being consequently relatively short; and finally, in Cases 1 and 2, in which a certain amount of visual power was obtained, the intruding fragment could be approximately located with the ophthalmoscope. These two cases may therefore be classed with those cases of primary extraction of McKeown (1 and 8), Hirschberg (12 and 24), Lloyd Owen, Hansen, Krenchel, Jany, Fränkel, Rheindorf, Mules, Aub, E. Meyer, and Fröhlich,[1] in all of which the metallic foreign body was visible in the anterior region of the vitreous, or, at least, was presumed to be there for good reasons, and in all of which a greater or lesser visual power was obtained.

In both of the cases, however (4 and 5), where the operation was delayed until twenty-four hours after the traumatism, and inflammatory phenomena (hypopyon) were already manifest (Laubi and Surbeck), namely, the presence of pus in the vitreous (Laubi), a moderate phthisis resulted, and the sight could not be restored. The cases of Hirschberg (16), Krenchel (3), Rheindorf (1, 2, 4), Hjort (2, 5), Pagenstecker, Krebs, Hansen-Grut, Knapp[1] (2 cases), and Dufour[2] (fragment of iron 1 *cm* long), belong to this category; as well as Rheindorf [8 and 10 (225 *mgrm*)], which, although operated at once, showed no perception of light from the very beginning.

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[1] *Klinische Monatsbl. f. Augenheilk.*, Bd. xxiii., S. 349.

B.—*Temporary Results.*

In two other of the eighteen cases, although momentarily successful, enucleation of the implicated eye was subsequently inevitable. The histories are as follows:

6. Weidmann. Received a chip of iron into the right eye, while chiselling. Prolapse of the iris at external inferior border of the cornea. Blood in the wound, and in the depths of the anterior chamber. Iris bulging very much towards the wound in the cornea, which is about 3 *mm* long. The external equator of the lens is easily visible, and uninjured. The depths of the vitreous filled with gray masses. Extraction with the magnet on the third day. Small flap incision with Gräfe's knife, without anæsthesia; a not inconsiderable loss of the vitreous followed immediately after, owing to the uneasiness of the patient. Upon the second introduction of the magnet, an irregularly angular piece of iron was drawn out, weighing at least 0.2 *grm*, and about 2 *mm* square. Excision of the protruding shreds of the iris; 2 per cent. carbolic-acid solution; wet salicylic-acid dressing.

Three days after, *plastic purulent cyclo-choroiditis*, and subsequently *occlusion of the pupil; purulent pupillary exudation. Loss of perception of light.* Finally, formation of an abscess about the size of a pea, at the site of the wound of extraction. Ciliary injection. Enucleation.

7. Bachmann. While hammering, a splinter of iron flew into the eye. Linear perforating wound of the cornea, 1 *mm* long. Traumatic cataract. Foreign body not visible. Magnet-extraction the following day: the straight, pointed magnet was pushed through the cornea and lens into the eyeball and then withdrawn, but without result; a second attempt was likewise unsuccessful. A wide-curved magnet was now passed in and moved around in

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[1] American Ophthal. Society, July, 1885.

[2] *Révue médicale de la suisse romande*, No. 7, 1885.

the globe; upon its withdrawal, the foreign body, about 5 *mm* long, was found attached to it. During the operation some of the substance of the lens was lost, and there was also some prolapse of the vitreous. On the sixth day, pronounced chemosis. Three days after, paracentesis of the anterior chamber. The swollen lens substance being emptied, some pus is visible in the vitreous. Seven weeks after, eye irritable and painful. Enucleation.

In the first of these cases, the weight of the foreign body was at least 200 *mgrm*, and therefore belongs to the category of the *excessively large* (Hirschberg), *even shortest sojourn* of which (according to this author) *renders the attainment of visual power impossible, and the preservation of the shape of the eye very questionable.* More than this, the operation did not take place *until the third day*, and was accompanied with *considerable loss of the vitreous body.* The second case seemed more favorable; the weight of the foreign body was only 6 *mgrm*, and successful extraction was accomplished on the following day, in spite of the fact that the foreign body could not be seen, or exactly localized; *repeated exploratory searching was required, however.* At first there were no signs of inflammation; these manifested themselves nevertheless—possibly owing to the exploration of the space of the vitreous—on the sixth day after the operation, and led to subsequent enucleation.

The same result was obtained in the cases of McKeown [2 (150 *mgrm*)], Hirschberg (17), with advanced purulent infiltration of the vitreous, Hirschberg (25, 26, and 27), in which the operation was done early; the weight of the foreign bodies 500, 240, and 200 respectively, of Rheindorf (3), with pus in the anterior chamber, chemosis and only quantitative perception of light, and (6) with advanced suppuration, S = 0 and 200 *mgrm* weight.

Furthermore, Krebs-Lorentzen's case (4), and the nine cases of Aub, and four of Knapp.[1]

C.—*Complete Failure.*

In eleven of the eighteen cases the magnet operation gave no result whatever from the very beginning. Two of these, after several days had elapsed, showed no signs of inflammation, but the foreign body could not be located, and attempts at extraction were without result, for some unknown reason. These patients were discharged with some remaining visual power and no signs of irritation. The histories are as follows:

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[1] Bei Hirschberg, u. a. a. O.

8. Steinmann (21 October, 1880). Foreign body received into right eye while chopping on the railroad. Crescentic wound, 2 *mm* long, 2½ *mm* distant from the corneal border, upwards and outwards. Corresponding to this is a vertical gaping wound, 2 *mm* long, in the middle of the iris; this part of the iris is adherent; peripheral traumatism of the lens; incipient cataract; fingers at 5 feet. Opthalmoscope: The lens is not sufficiently transparent to distinguish the details of the fundus, still considerable red light is present; projection absolutely good. Operation with the electro-magnet on the fourth day with a view to bringing the foreign body into sight; no visible change, excepting a twitching sensation in the eye upon closing the current. Sent home with an occlusion bandage for several days, and has never returned.

9. Keller (March 28, 1881). While sharpening some instrument a foreign body flew into the eye. Central corneal wound; perforation of the capsule of the lens at its centre; traumatic cataract. Pupil dilated with atropine, but nothing can be seen. Perception of light and projection good. Nine days afterwards: Extractio lentis temporalis as usual; prolapse of the vitreous. In spite of repeated introduction of Fröhlich's electro-magnet into the eyeball, no result is obtained. Three weeks afterwards, fingers at 5 feet, with cataract glasses. About one month after, quantitative perception of light. Outward and downward projection is wanting.

Similar cases are Hirschberg's (29 and 30) and Dufour's (3 and 4)[1]. Attempts at magnetic extraction were likewise unsuccessful in three other cases, and enucleation was afterwards performed.

10. Hänseler (19 November, 1880) gives history of having received a piece of steel into the eye five days ago. Chemosis; pupil irregular and drawn in towards the wound; hypopyon; a

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[1] Hirschberg, u. a. a. O.

cicatrix about 2 *mm* long in the upper limbus of the cornea. Lens shows cataractous opacity, especially at upper part. Opthalmoscope gives no result. The lower part of the field of vision is lacking ; foreign body is therefore situated in the upper part of the vitreous. Attempts at extraction with the electro-magnet are fruitless. Enucleation.

11. Bühler (September 7, 1882). Flying splinter from the hammer received in left eye. Following day, oblique incision in the direction of the wound ; most of the lens is emptied ; repeated introduction of the magnet without response ; the prolapsed vitreous lopped off. Eyeball very sensitive to pressure. Enucleation four days after.

12. Nussberger. A piece of iron flew into left eye while casting, on January 29th. February 1st, the cornea and lens are perforated, as seen by inspection of the wound, 1 *mm* in length. A small shred of the vitreous body hangs from the somewhat swollen lips of the corneal wound, which is situated opposite the external border of the pupil. The cornea itself shows a diffuse opacity. The anterior chamber is smaller than on the right side, without blood ; iris discolored and muddy. Base of the eye is clouded over. Visual power reduced to almost nothing. Pain and injection of the conjunctiva are relatively slight.

The pupil responds pretty well to atropine ; several flakes of cortex are seen in the depths of the anterior chamber ; cataract completely developed ; fingers at one foot ; projection good. An aperture is made for the introduction of the magnet, with a Beer's knife, incision lying between the insertion of the external and inferior recti muscles. Attempt at extraction was a failure, however. The patient complains of a good deal of pain after the operation, which is somewhat relieved by ice.

February 2d.—Reappearance of pain.

February 3d.—Conjunctiva shows slight chemosis, and towards evening swells up greatly.

Panophthalmitis. Poultices ; morphine ; chloral.

February 13th.—The panophthalmitis has somewhat subsided. The eye is less painful.

February 16th.—Enucleation.

Unfortunately these three eyeballs, as well as the reports of the sections, are missing. *The cause of failure is therefore unknown.* It is possible that a foreign body would not have been found in the enucleated globe, as was also the case with Hirschberg (23 and 31).

The causes of failure in the two following cases, however, are very plausible.

13. Stulz (July 16, 1883), while standing about four feet away from a man engaged in chiselling, was struck in the right eye by a flying chip. Counts fingers at two feet. The wound of the cornea begins 2 *mm* from the inner corneal border, and, describing a concavity upwards, reaches to the centre. There is a corresponding rent in the iris. Lens swollen and cloudy; a shred of the vitreous hangs out of the wound. The same evening repeated attempts at extraction through wound in the cornea were made with the magnet, but were unsuccessful. Chemosis. Some indication of panophthalmitis. *Enucleation. The foreign body lies very solidly imbedded in the sclera, somewhat under the optic nerve, and is quite large in size.*

14. Strasser (June 24, 1885). About four weeks ago the patient got something in his left eye while watching some iron-workers. A fine cicatricial point of entrance is found near the inner border of the cornea, and is tinged with blackish coloring. Slight opacity of the lens, especially at anterior pole. Funnel-shaped detachment of retina with numerous spots. *The foreign body is low down and glistens visibly; very movable*, perhaps between retina and choroid. Tension decreased. Movements of fingers externally only. An *unsuccessful* attempt to remove the foreign body is made with the magnet. Point of incision of the sclera between internal and inferior recti muscles. The patient was at once chloroformed,and the left eye *enucleated. Dissection of the eyeball reveals the foreign body solidly planted in the retina; it cannot be removed even when the magnet is laid directly upon it. Upon raising the magnet, the whole retina is drawn with it.*

Such cases, in which the foreign body is firmly wedged into the membranes of the globe, and where, of course, the magnet is powerless, are comparatively not so rare, and are even a frequent cause of failure. In four of the twelve (28, 32, 33, and 34) failures in Hirschberg's twenty-four cases of magnet operation in the posterior section of the eyeball, a similar implication of the membranes of the eye is noted. Moreover we find nine such, described by Snell, Glascott (3), Lloyd Owen, Bronner and Appleyard, Schiess-Gemuseus (2), Hansen-Grut (8), Samelsohn, Dufour,[1] and Galezowski.[2]

In the following case the implantation was less solid, and therefore there may have been other circumstances which contributed to frustrate the action of the magnet.

15. Meyer (June 21, 1881). Perforating wound of cornea and lens. Patient says that a piece of iron struck him in the eye half an hour ago. Atropine immediately, but no dilatation of the pupil; the wound was then enlarged with the narrow knife and the electro-magnet introduced through the wound, but unfortunately without extraction of the splinter of iron, and *it seems probable that no such body is present in the eye.* On the tenth day the corneal wound is infiltrated, and pus is noted in the anterior chamber. Perception of light and projection bad. Enucleation.

Four years after, the globe is subjected to a careful examination, and now *an extremely small metallic splinter is found in the choroid at the most posterior section of the eyeball; it is also slightly imbedded in the sclerotic*, and required considerable teasing and detachment of the membranes before it was finally dislodged.

It is possible that in this case the insertion of the foreign body, which was not absolutely solid, was not the sole cause of failure, but that its remoteness (in the most posterior section of the globe) from the magnet at the corneal wound contributed to produce this effect.

In the following case, operated at an early date, it is not positively certain whether the foreign body was solidly imbedded in the membranes of the eyeball from the first, thus affording a resistance to the action of the magnet, or whether it was subsequently capsulated by a later choroiditis and thus held fast. Enucleation was not performed until several weeks had elapsed.

16. Niggli (May 5, 1882). While hammering tin, a foreign body flew into the right eye, probably from the hammer. Chemosis. Hypopyon.

A wound 5 *mm* long in the neighborhood of the external border of the cornea, and a large hole in the iris corresponding to this.

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[1] *L. c.*

[2] "Sur l'emploi de l'aimant." Paris, 1885.

Pupil very irregularly dilated. There still remains a little red light in the eye. Projection good. Fingers are counted at nine or ten feet. Hypopyon evacuated the following afternoon through the wound. In the evening the anterior chamber is abolished; the wound enlarged downwards with the scissors and the electro-magnet passed in repeatedly, deep into the globe, in the direction of the supposed foreign body, but without result.

Excessive chemosis appears the next day, but disappears later on.

Perception of light and projection good.

Panophthalmitis three weeks after. Partial evacuation of the eyeball; subsequently enucleation. The foreign body weighs 0.031 *grm* and was found in the lower part of the globe, in the neighborbood of the equator, firmly capsulated between the choroid and sclerotic.

On the other hand, subsequent formation of connective tissue and capsulation were undoubtedly the cause of failure in the following csse.

17. Dunke. Traumatism of the right eye, while chopping, two weeks ago. The foreign body has pierced the lower inner border of the cornea. Iris wound. Hypopyon. Foreign body is visible with the ophthalmoscope, inwards and downwards in the vitreous, not far from the pupil. Enucleation is proposed. Incision in the sclerotic downwards and inwards, and vain efforts to extract with the magnet. The eye then enucleated.

The foreign body lies close to the retina and is connected with the latter by a fine thread. After opening the globe, it could not be removed with the magnet. During the attempts at extraction the magnet must have passed close by the foreign body.

Burchardt's case (Hirschberg, page 86) is quite analogous to this one. In these two latter cases, the question quite naturally arises as to what extent the products of inflammation hindered the action of the magnet. This would, of course, depend upon the consistency of these products. According to Knapp, fluid pus does not interfere with the action of the magnet. Should, however, the pus be capsulated by a membrane, be it ever so thin, this would undoubtedly be an obstacle which would have to be overcome (Knapp). When the foreign body is surrounded by tough, coagulated fibrinous masses, the task of extraction with the magnet is rendered more difficult, if not impossible. Such cases, resulting in failure, are those of Hirschberg (18), Hansen-Grut (9, 10, 11), Aub, and Galezowski[1] (3). The importance of this point is recognized by Knapp and Hansen-Grut as a reason for early operation, before the exudation becomes too solid, or complete capsulation takes place. A similar case of our own may be used in illustration.

18. Braunschweiler (August 19, 1883). Struck in the eye with a small piece of steel. Horizontal wound of the cornea, 3 *mm* in length, and under the centre. The region of the wound is clear. Moderate pericorneal injection. Pupil contracted; the cortical substance oozes through the latter into the anterior chamber. Iris hyperæmic. The eyeball is sensitive to pressure. Fingers at two feet. Atropine. Fingers now at six feet. There is a gaping tear in the anterior capsule, passing inwards and upwards. Distinct breaking up of anterior cortex. The posterior cortex is opaque, especially at the point of passage of the foreign body through the posterior capsule. Operation with the magnet on the third day: Conjunctival flap between internal and inferior recti muscles. Incision in the sclerotic parallel to the course of the muscle. The magnet is introduced three times without effect. No loss of the vitreous to speak of. The following day, slight chemosis, and great irritation. Pupil contracted.

Two weeks after: Great irritation. Pain on pressure. Perception of light at one foot. Enucleation. The section of the eyeball demonstrates a large focus of pus in the internal lower region, in the middle of which, close to the wall of the globe, lies a splinter of iron, about 2½ *mm* long and 1 *mm* wide, surrounded by a mass of fibrinous exudation. There are no scars in the walls of the eyeball, except those made by the attempts at extraction. The vitreous is dark and fluid—likewise the remains of the cataract.

In this case, however, the foreign body was supposed at first to be located above and internally, and the magnet was primarily introduced in that direction. The capsulation may have taken place subsequent to the operation, as enucleation was not performed until two weeks after.

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[1] *L. c., Archiv für Augenheilkunde*, xviii.

According to our experience, and reviewing the observations of others, there are **two conditions absolutely necessary for the successful extraction of bodies situated in the posterior portion of the globe,** viz.:

1. The foreign body must be freely movable; and 2, the distance to it must be short.

When surrounded by exudative masses, firmly imbedded in the membranes of the eyeball, or enclosed in a connective-tissue capsule, the foreign body is immovable, and therefore inaccessible to the magnet. This immobility is the most frequent cause of failure, as was undoubtedly the case in four (13, 14, 16, and 17) [and possibly in two (15 and 18) others] of our eleven cases of **failure**; also in seven of Hirschberg's unsuccessful cases, and in fourteen of the remaining twenty-seven cases, mentioned in the literature of the subject—**in a word, fifty per cent. of all the cases.** The advantages of early operation are quite obvious, as very often subsequent capsulation of an originally movable foreign body frequently takes place.

The great distance of the foreign body from the magnet was the cause of failure in Vossius-Hippel's case, and possibly also in our own case (Meyer), and perhaps in Hirschberg's (No. 20). Foreign bodies, situated in the anterior and central portions of the vitreous, when not exactly localized, are more accessible to the action of the magnet than those lying posteriorly or deep downwards and sidewards. It is of primary importance, therefore, to first localize the foreign body as precisely as possible, in order to get at it in the shortest and most direct way, and bring the point of the magnet in direct contact with it, thus rendering even bodies in the most posterior regions accessible to magnetic influence. To what extent the existence of both of these factors—*mobility of the foreign body and its correct localization*—may contribute to the complete success of the magnet operation, even to the attainment of a satisfactory visual power, is shown by the cases of secondary and tertiary extraction of Hirschberg, Fränkel, Alexander, Schiess-Gemuseus, Jany,[1] and others.

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[1] *Deutsche med. Wochenschr.*, 1885, No. 47.

Important points, as far as prognosis is concerned, are whether inflammatory phenomena, such as the presence of pus in the vitreous, have manifested themselves; whether the size of the foreign body exceeds a certain limit (200 *mgrm*); whether there is presence or absence of perception of light. The existence of any one of these three unfavorable symptoms renders the prognosis as to visual power very dubious, even though extraction be completely successful. There is still some chance of preservation of the eye, but in many cases subsequent enucleation becomes necessary.

When there exist advanced inflammatory manifestations and deficient localization, we are sometimes quite justified in an expectant treatment, for the foreign body may become visible owing to absorption of the inflammatory products; and even if capsulated, may remain for a longer or shorter time within the eye without reaction or without interference with its function.

To return to the question of the magnet operation as applied to the posterior region of the globe, we find the following results have been obtained:

Of the 154 cases known to literature, a more or less satisfactory visual power was obtained in 47–48 cases = 30½ per cent.

[Hirschberg 3 cases, Horner 2 or 3 (Weber's case ?)], while in 16 other cases, or 10⅘ per cent., almost normal acuteness of vision was attained.

The form of the globe without sight was preserved in 27 cases = 17½ per cent. (Hirschberg 3 cases, Horner 2). Whether the cosmetic results thus obtained were satisfactory or not is questionable, but this seems to have been the case with about twelve of the patients.

Four other cases were not followed up, and it is not known whether enucleation was necessary at a later period.

In 16 cases subsequent enucleation was inevitable = 10⅘ per cent. (4 by Hirschberg and 2 by Horner).

Finally, in 55 cases = 37 per cent., the magnet operation was unsuccessful from the very beginning (14 by Hirschberg, including Burchardt's case, and 11 by Horner).

ON DR. RANDOLPH'S CRITICISM OF MY EXPERIMENTS ON SYMPATHETIC OPHTHALMIA.

By H. GIFFORD.

IN the article of Dr. Randolph, on "Sympathetic Ophthalmia," in the last issue of the ARCHIVES, the experiments in which I traced in rabbits the anthrax bacillus from one eye to the other, are referred to in a way that is calculated to discredit them entirely with those who have not recently read my paper carefully. He says (page 211): "It is strange that Dr. Gifford should have used the anthrax bacillus for such experiments. He could not have selected an organism which would have given him results less valuable to the history of the subject." Had Dr. Randolph read my article with care he could hardly have made such sweeping and discrediting statements, for I there (these ARCHIVES, xv., 3, p. 284) gave the particular reasons which led me to select the anthrax bacillus, after having failed to confirm Deutschmann's results with the pus-cocci. Everybody knows that, in most cases, when an animal dies of generalized anthrax, the blood-vessels throughout the body, including the eyes, of course, contain the bacilli. Allowing for this I hoped, nevertheless, that as the anthrax causes comparatively little of the emigration of leucocytes which hindered the progress of the pus-cocci, the bacilli might make the passage through the lymph-spaces by way of the cranial cavity to the second eye, before the animal was killed by the general infection; and this really occurred in three out of twenty-five cases. In two of these cases no bacilli were to be found anywhere in the blood-vessels; but they were present in immense numbers in the lymph-spaces leading along the retinal and orbital vessels from the vitreous to the brain, and from there down through the intervaginal space of the opticus to the suprachoroidal space of the second eye. The twenty-two rabbits in which the experiment failed constitute an ample control, for though they died of anthrax, and the bacilli were found in the blood-vessels of both eyes, absolutely no free bacilli were found in the cranial cavity or intervaginal and suprachoroidal spaces of the second eye, as death occurred before they had passed more than a short distance into the orbit from the vitreous of the first eye.

If any observer should find as the result of an ordinary subcutaneous anthrax-inoculation, the condition of the lymph-channels of the optic nerves and orbital tissue, which I have figured and described as evidence of the passage of bacilli from one eye to the other, the value of my experiments would of course be impaired; but I have not been able to make any such find myself, nor do I know of any one that has.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE FOURTH QUARTER OF THE YEAR 1887.

By H. MAGNUS, Breslau ; C. HORSTMANN, Berlin ; and
A. NIEDEN, Bochum.

WITH THE CO-OPERATION OF

S. M. Burnett, Washington ; Dantone, Rome ; Hirschmann, Charkow ;
E. Marckwort, Antwerp ; P. v. Mittelstädt, Metz ; Werner,
Dublin ; C. H. A. Westhoff, Amsterdam ; Schiötz
and Ole Bull, Christiania, etc.

Sections I.–V. Reviewed by Prof. H. MAGNUS.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

416. Howe. Increase of blindness in the United States. *Amer. Jour. Ophth.*, Sept., 1887.

Howe (416) found that while from 1870 to 1880 the population of the United States has increased 30 per cent., the number of the blind has increased 140 per cent., the number decreasing from the East to the West, but increasing from the North to the South. They have cost the United States during 1887 more than 25 millions of dollars. The American Ophthalmological Society appointed a commission to consider the introduction of rational methods of preventing blindness.

b.—STATISTICAL PAPERS.

417. Annali di Statistica. Inchiesta statistica sugli Instituti dei sordomuti e dei ciechi. Roma, Pasqualini e Zappa, 1887.

418. FIEUZAL. Mouvement de la clinique pendant le 3e trimestre 1887. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts*, July–Sept., 1887.

419. FIEUZAL. Revue clinique du dernier trimestre. Do.

According to the statistics published by the Italian Department for Commerce and Agriculture (417) there were in Italy 21,718 blind persons when the census was taken in 1881, equal to 7.73 to 10,000 inhabitants against 10.5 to the same number of inhabitants, the ratio found at the census of 1871. The lowest percentage was found in the mountainous regions (5.7 : 10,000), the highest on the island of Sardinia (21.1 : 10,000). DANTONE.

FIEUZAL (418) treated, during the third quarter of the year 1887, 2,791 new patients, and performed 422 operations, among them 143 on the lens, 43 iridectomies, and 30 enucleations.

v. MITTELSTÄDT.

FIEUZAL (419) treated, during the last quarter of the year 1887, 2,205 new patients, of whom 310 were admitted to the hospital.

v. MITTELSTÄDT.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

420. DEUTSCHMANN. On sympathetic ophthalmia. Aerztl. Verein zu Hamburg, meeting of Oct. 25, 1887. *Deutsche med. Wochenschr.*, 1887, p 73.

DEUTSCHMANN (420) considers sympathetic ophthalmia an infectious process, which is transmitted from one eye to the other through the optic nerve. In the discussion Salomon denies the general admissibility of this statement. Deutschmann seeks to break the force of the objections to his theory by distinguishing between sympathetic irritation and sympathetic inflammation, the former may be due to a reflex irritation, the latter always to infection.

421. GAYET. Recherches expérimentales sur l'antisepsie et l'asepsie oculaires. *Arch. d'ophth.*, vol. vii., 5.

422. FIEUZAL. De la révulsion et de la dérivation par les émissions sanguines dans les maladies des yeux. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts*, vol. v., 3.

423. LANG. On the insertion of artificial globes into Tenon's capsule after excising the eye. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 286.

424. MAZZA. Le iniezioni ipodermiche di calomelano. Re-

cerche anatomiche e sperimentali come contributo alla etiologia del pus. *Ann. di ottalm.*, vol. xvi., 4, p. 283.

425.. PANAS. Quelques courtes remarques au sujet du travail du Dr. C. Hess de Prague sur la cataracte naphthalinique. *Arch. d'ophth.*, vol. vii., 6.

426. ROLLAND. Explication expérimentale de l'immunité apanophthalmique des grains de plomb. *Rec. d'ophth.*, Sept. 1887, p. 530.

In this very interesting paper GAYET (421) reports at length his investigations on the micro-organisms which may be found in the conjunctival sac in spite of the most thorough antiseptics. With the aid of pure cultures and inoculation of rabbits, Gayet tries to determine the nature and importance of the various kinds of micro-organisms, and from the operative results obtained shows their influence on the course of healing of an extraction. In the first series of 178 cataracts the whole body was first thoroughly cleansed, also the mouth and nose, and then the conjunctival sac was washed out in the course of a few hours with a concentrated solution of boric acid or with sublimate 1:6,000 from four to twenty-nine times, the eye being then bandaged aseptically. Just before the incision, and after another cleansing of the sac, some of the liquid from beneath the upper lid was transferred to gelatine, all antiseptic precautions being observed, which was followed in 139 cases by the development of micro-organisms, while in 39 this did not take place. In a second series, treated only with boric acid, micro-organisms were found in 32 cases. Only 16 % were free from germs among the men, 38 % among the women. Among 213 cases there were micro-organisms therefore in 171, nevertheless infection took place in only 13 cases. For details, see the original. The author comes to the following conclusions: 1. The majority of eyes contain micro-organisms beneath the lids, no matter whether the persons are inside or outside a hospital. 2. The antiseptic remedies employed seemed to have only a slight effect. We are never certain of having destroyed all the germs. 3. Several varieties are found—staphylococcus aureus, citreus, and albus, also bacilli and bacteria. 4. Not all the germs are pathogenic. 5. Among the cocci some are pathogenic, as they were found in eyes in which a purulent inflammation had developed, and the inoculation of rabbits with pure cultures also produced an inflammation. 6. Some of the cocci are not dangerous, as inoculation with them did not cause suppuration. v. MITTELSTÄDT.

The abscesses caused by injections of calomel at the temple (0.30 pro dosi in glycerine), a favorite remedy of Italian physicians against iritis and iridocyclitis, were investigated by MAZZA (424). He found they contained pieces of tissue, cellular elements resembling leucocytes, but often larger, and occasionally cocci. The latter are not pyogenic, neither is the pus of the abscess. These injections always produce an abscess, in spite of the strictest antiseptic precautions. There are no constitutional symptoms.

DANTONE.

ROLLAND (426) finds that panophthalmitis does not follow the entrance of lead shot into the eye because the shot generally penetrates under aseptic conditions. MARCKWORT.

III.—INSTRUMENTS AND REMEDIES.

a.—INSTRUMENTS AND TECHNICAL CONTRIVANCES.

427. ARMAIGNAC. Blépharostat fixateur du Dr. H. Armaignac. *Rev. clin. d'ocul.*, Nov., 1887.

428. JESSOP. New ophthalmoscope for students and practitioners. *Brit. Med. Journ*, Oct., 1887.

ARMAIGNAC (427) has devised a contrivance to be attached to the speculum in those cases in which assistance cannot be had. This little fixation-forceps seems to resemble the serres-fines. The conjunctiva is seized with it, the speculum introduced, and the forceps attached to a little plate on the middle of the lower branch. In detaching it it is only necessary to open the branches of the forceps, when it can be removed with the speculum.

v. MITTELSTÄDT.

b.—REMEDIES.

429. ALT, A. The bichloride of mercury in the treatment of external diseases of the eye. *Amer. Jour. Ophth.*, Nov., 1887.

430. CASTALDI. Sulla utilità delle pennellazioni di soluzioni di sublimato corrosivo nelle lesioni lupose della cute.

431. JACKSON, E. When and how to use mydriatics in the eye. *Ophth. Rev.*, Aug., 1887.

432. SCHWEINITZ and HARE. Contribution to the physiological action of hydrobromate of homatropine. *Med. News*, Dec., 24, 1887.

ALT (429) uses for external application the mercuric bichloride in strength varying from 1 to 2,500 to 1 to 10,000. He has found it useful in simple, acute, and chronic conjunctivitis, and in the purulent forms, also in cases of diphtheria of the conjunctiva; he has not found it useful in phlyctenular ophthalmia, nor in ulcers of the cornea, nor in any form of keratitis. BURNETT.

CASTALDI (430) reports on four cases of extensive lupous ulcers, which had also attacked the lids, but which completely cicatrized under the application of a 1 % solution of sublimate, after all other remedies had failed. He then discusses at length the histological structure of the lupus nodules and their analogy to those of tuberculosis. DANTONE.

JACKSON (431) discusses the application of mydriatics. If it is merely desired to dilate the normal pupil, he prefers to use cocaine (1 : 25), because it produces the greatest mydriasis and because its action can be neutralized soonest by myotics. Atropine or duboisine are indicated when the accommodation is to be paralyzed completely and for some time, while for a temporary paralysis for the purpose of diagnosis homatropine (1 : 50) is preferable. For inflammatory conditions of the iris atropine (1 : 60–120) is the best remedy.

SCHWEINITZ and HARE (432) confirm the results of the experiments of Risley and Jackson as to the effects of hydrobromate of homatropine on the eye. They consider it reliable as a paralyzer of accommodation for testing refraction. A drop to be put in the eye at bedtime and every fifteen minutes for an hour or an hour and a half the next morning just before the examination is to be made. The action on the accommodation begins to pass away in an hour, and is lost in thirty-six hours. BURNETT.

IV.—ANATOMY.

a.—GENERAL ANATOMY.

433. FITZGERALD. Microphthalmus congenitus. Acad. of Med. in Ireland, Dec. 2, 1887. *Centralbl. f. prakt. Augenhk.*, 1888, p. 21.

434. NEARY. Anophthalmus duplex congenitus. *Ibid.*

435. MAPOTHER. Eyeless fishes. Acad. of Med. in Ireland, Dec. 2, 1887. *Centralbl. f. prakt. Augenhk.*, 1888, p. 20.

NEARY (434) reports a case of congenital double anophthalmus. Lids and orbit normal. In connection with this Story remarks that these cases are very rare and difficult to explain; the reviewer, however, must deny the latter assertion, as the paper by

Arlt has fully explained the development of anophthalmus, so that no further difficulties exist on that subject.

Mapother (435) found in five eyeless fishes from the mammoth caves of Kentucky no indications of a visual organ or optic nerve. There was, however, a well developed ramus ophthalmicus in the region where the eye should have been. The power of hearing was markedly developed in these animals.

b.—ORBIT, CONJUNCTIVA, MUSCLES.

436. Delbet. Note sur les nerfs de l'orbite. *Arch. d'ophth.* Nov.–Dec., 1887, p. 485.

Delbet (436) for a prize essay examined the nerves of a large number of orbits and found that they differed in several respects from the conditions usually accepted. He endeavored to ascertain the usual conditions in distribution, course, and anastomosis. He explains the difference between authors by assuming that the number of orbits examined by them has been too small. He describes in detail the arrangement of the sensitive and motor nerves and their anastomoses, and of the ciliary ganglion and its branches, taking into consideration the views of others and the conditions found by them. It is worthy of note that he considers Badal's operation (stretching of the N. infratrochlearis) impossible, as only the middle branch of its terminal branches can be reached. v. Mittelstädt.

437. Gallenga. Structure of the pinguecula. Congress of the Ital. Ophth. Soc., Sept., 1887. *Centralb. f. prakt. Augenhk.*, Nov., 1887.

Gallenga (437) found in the pinguecula a duct lined with epithelium and extending inwards.

438. Jessop. Abstracts of lectures on the intraocular muscles of mammals and birds. Lecture III. *Ophth. Rev.*, 1887, p. 315.

Jessop (438) found that eserine directly irritates the muscular fibres, while atropine paralyzes them. Cocaine irritates the endings of the nerves and relaxes the muscular fibres.

c.—LENS AND VITREOUS.

439. Hache. Sur la structure et la signification morphologique du corps vitré. Communication à l'Acad. des sci. *France méd.*, 1887, p. 1143.

440. Hänsell. Contribution à l'étude d'embryologie du

crystallin. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts.*, vol. v., 3.

HACHE (439) shows that the vitreous is a substance which can yield up its water and is then capable to a high degree of re-absorbing it. MARCKWORT.

HÄNSELL (440) describes the development of the lens fibres from his investigations of the eyes of animals. The change from epithelial cells to lens fibres takes place, as the author concludes from an observation of a traumatic cataract, by division of the nuclei and conversion of the chromatine into the achromatine substance which furnishes the material for the lens fibres.

V. MITTELSTÄDT.

d.—RETINA AND OPTIC NERVE.

441. KOSTENITSCH. The development of the rods, cones, and outer granular layer of the retina of the human embryo. *Inaug. Diss.*, St. Petersburg, 1887.

442. MAGNUS. Further contributions to the knowledge of the congenital grayish-white opacity surrounding the macula lutea. *Klin. Monatsbl. f. Augenhk.*, 1887, p. 391.

443. TARTUFERI. Sulla strato dei granuli interni della retina. *Giorn. della R. Accad. di Med. di Torino*, vol. l., 5, p. 242.

444. TARTUFERI. Sulla anatomia della retina. Torino, 1887.

KOSTENITSCH (441) arrived at the following results from his investigations conducted at the laboratory of Professor Owssjannikow: 1. The rods and cones develop from the protoplasm of the embryonic cells of the outer granular layer of the retina towards the end of the fourth month of uterine life. 2. In the outer granular layer of the human embryo there are supporting-cells besides the nuclei of the rods and cones. 3. The supporting-fibres of the retina subdivide into delicate threads, which end at the outer edge of the retina. 4. The differentiation of the outer granular layer, as well as that of the rods and cones, extends from the papilla to the periphery. 5. The retina of an embryo eight months old is almost complete in its structure and capable of perception of light. 6. In the cones of a new-born child there are prolongations and auxiliary bodies. 7. In the rods and cones axis-cylinders are indicated. 8. The macula lutea is not yet developed in the new-born. HIRSCHMANN.

MAGNUS (442) describes another case of grayish-white congenital opacity around the fovea centralis; the pathological changes in this case, however, completely disappeared, so that the macula lutea finally presented a normal appearance. Lately Hirschberg has seen a similar case; Knapp and Goldzieher had previously verified the observation of Magnus.

TARTUFERI (443) reports in a preliminary notice that the majority of the cells of the inner granular layer of the retina contain a body resembling a pear, and that they possess an inner and an outer offset. DANTONE.

445. MAGNUS. A case of bilateral congenital microphthalmus with coloboma of the optic nerve of the right eye. *Klin. Monatsbl. f. Augenkk.*, 1887, p. 485.

446. MICHEL. On degeneration and decussation of the optic nerve. Jubilee-paper of the medical faculty of Würzburg University in honor of the 70th anniversary of Kölliker's birthday. Wiesbaden, 1887.

447. SIEMERLING. Case of gummous affection of the base of the brain affecting also the chiasma. A contribution to the knowledge of the course of the fibres in the optical conducting apparatus. *Arch. f. Psych.*, vol. xix., 2.

MICHEL (446) has again investigated the course of the fibres in the chiasma of man and various animals, and he concludes that in man total decussation takes place.

SIEMERLING (447) reports as follows on the course of the fibres in the optical conducting apparatus of man: the fibres which supply the lateral part of the retina, *i. e.*, essentially the fibres of the uncrossed fascicle, take a lateral course in the optic nerve, their greater part reaching the periphery, lying in the intraorbital part more below, but nearer the brain lying more on the outer side. In the chiasm the uncrossed fascicle lies laterally in the anterior part at the ventral surface, and then gradually changing to the dorsal position which it occupies in the posterior part. In the tractus the uncrossed fascicle occupies a central position, and never reaches the periphery.

V.—PHYSIOLOGY.

a.—GENERAL PHYSIOLOGY.

448. ADDARIO. On entoptic phenomena. Ital. Ophth. Soc., Sept., 1887. *Centralbl. f. prakt. Augenhk.*, 1887, p. 338.

449. SOUS. Vision binoculaire et refraction. *Rev. clin. d'ocul.*, Oct., 1887, No. 10.

ADDARIO (448) refers the erythropsia observed with closed lids to the blood of the latter; under certain conditions he sees a delicate network filled in with large round cells, which he ascribes to the ganglion cells of the retina.

SOUS (449) determined the refraction in 78 cases of H and 129 of M in monocular and binocular vision, and found it in the latter less in 54 and 117 cases respectively than in the former. In opposition to v. Reuss and Nagel he attributes this diminution of refraction to the convergence which takes place in binocular vision (at the usual distance of the test-types), whereby the rays of light fall obliquely upon the lens, and are thus less refracted than in seeing with one eye, when they fall perpendicularly upon the cornea. In exceptional cases the author thinks abnormal curvature of the cornea or the angle α may be the cause.

v. MITTELSTÄDT.

b.—LENS AND VITREOUS.

450. LEPLAT. Etudes sur la nutrition du corps vitré. *Ann. d'ocul.*, xcviii., p. 89.

451. MATTHIESSEN. Contributions to the dioptrics of the crystalline lens. III. *Zeitschr. f. vergl. Augenhk.*, vol. v., 2.

LEPLAT (450) injected iodide of potassium under the skin of rabbits, and after varying periods of time enucleated the eyes, froze them, divided them into 7 similarly situated pieces, and then determined chemically the amount of iodide of potassium they contained. Seven hours after the injection the eye contained most, and 38 hours afterwards he still found traces of it at the papilla. He concludes that the ciliary body secretes liquid, one part of which forms the aqueous humor, which leaves the eye through Fontana's spaces, while the other passes through the vitreous and escapes through the canalis centralis of the optic nerve.

MARCKWORT.

c.—RETINA AND CENTRAL ORGAN.

452. DENISSENKO. The importance of the changes which take place in the eye under the influence of light. *Wjestnik Ophth.*, 1887, Nos. 4–6.

453. VAN GENDEREN STORT. On the changes of form and position of the retinal elements under the influence of light and darkness. *Arch. f. Ophth.*, vol. xxxiii., No. 3, and *Extr. des Arch. Néerland. de science*, vol. xxi.

454. RAMPOLDI. Sul centro retrattore dei bulbi visivi nella rana. *Ann. di ottalm.*, vol. xvi., 4, p. 247.

Denissenko (452) sets up the following theory on the action of light on the eye: its action is partly chemical, partly physical. The former manifests itself by bleaching the visual purple and by the differentiation of the discs in the outer portions of the rods and cones. The latter the author would refer to a change in reaction, calling to mind the observation of M. Schultze, that this phenomenon takes place when the reaction is slightly acid. The mechanical consequences of the action of light consist in shortening of the rods and cones, displacement of the pigment to the membrana limitans externa, and enlargement of the retinal spaces (cavities). This dilatation produces a strong current of liquid (from the suprachoroid) and a movement of pigment towards the retina and between its elements, whereby the material decomposed by the action of the light is replaced. He confirms the observation of Engelmann that when only one eye is illuminated, movement of the pigment takes place in the other also, which he ascribes to transmission of the irritation. The changes in the rods and cones are due to direct action of the light. The current of liquid due to the action of light passes from the suprachoroid into the enlarged retinal spaces, which in men lie in the inner granular layer. The dilatation of the enlarged retinal spaces takes place by reflex action from the central nervous system. When the current of liquid passing inward is checked (for instance in choroidal affections), the pigment epithelium and the layer of rods and cones suffer and disintegrate. The latter undergo fatty degeneration or subdivide, become small and round. They are not replaced after being acted upon by light and are destroyed. Hirschmann.

Rampoldi (454) has found the nerve centre governing the retraction of the frog's eye in the medulla oblongata at the edge of the fossa rhomboidalis. When mechanical or galvanic irritation is applied at this point, either one or both eyeballs are retracted, the former taking place when one of the lateral portions is irritated, the latter when the median portion is thus affected. Sometimes other movements also occur, but not constantly.

Dantone.

Sections VI.–XI. Reviewed by Dr. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

455. Fano. L'hypermetropie des petits enfants. *Journ. d'ocul. et de chir.*, Dec., 1887.

456. Jackman, W. T. On the eyesight in village school children. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 326.

457. Reymond e Baiardi. Sulla visione nell' astigmatismo. *Giorn. di R. Accad. di Med. di Torino*, vol. l., 5, p. 240.

458. Risley, S. D. Additional cases of hypermetropic refraction, passing while under observation into myopia. *Amer. Ophth. Soc.*, 1887.

459. Sous, G. Vision binoculaire et réfraction. *Rev. clin. d'ocul.*, 1887, No. 10.

Jackman (456) examined 456 children in seven schools. In 6.5 % he found hypermetropia, in 2.17 % myopia, in 10.5 % astigmatism, and in 5.04 % anisometropia. There was color blindness in 1.7 %., insufficiency of the internal recti in 3.7 %, and strabismus in 2.8 %. E. Werner.

Risley (458) observed in nine cases conversion of hypermetropia into myopia by way of astigmatic changes. All complained of asthenopic symptoms, and showed marked choroidal irritation and insufficiency of the internal recti. To prevent the development of myopia the ametropia must be corrected, even though the degree of astigmatism may be low.

VII.—LIDS.

460. Despagnet. Les poux des paupières. *Rec. d'ophth.*, 1887, No. 11, p. 674.

461. Dehenne. Traitement de l'entropion par le thérmocautère. *Union Méd.*, 1887, No. 570.

462. Millingen, E. van. The tarsocheiloplastic operation for the cure of trichiasis. *Ophth. Rev.*, 1887, No. 73, p. 309.

463. Noyes, H. D. Operation for the relief of entropium of the lower eyelid. *Amer. Ophth. Soc.*, 1887.

464. Ormerod, J. A. Ecchymosis and œdema of the eyelids without obvious cause. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 101. Three cases.

465. Pfalz, G. On a method of operating for entropium and trichiasis. *Arch. f. Ophth.*, vol. xxxiii., 3, p. 165.

466. Phillips, Sidney. Associated movements of upper lid with movement of eyeball. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 306.

467. RANDALL, B. A. A case of sarcoma of the eyelid, simulating a Meibomian cyst. *Amer. Ophth. Soc.*, 1887.

468. VAN DUYSE et CRUYL. Myxosarcome de la paupière supérieure. *Ann. d'ocul.*, vol. xcviii., p. 112.

469. WILLIAMS. Treatment of chalazion. *St. Louis Med. and Surg. Journ.*, vol. liii., No. 5.

In entropium of the lower lid NOYES (463) cuts a narrow piece of skin out of the base and attaches the free end of the everted flap to the freshened edge of the conjunctiva.

MILLINGEN (462) proposes a method of operating for trichiasis which abolishes the tendency of the conjunctiva to turn skin inward. He first makes the intermarginal incision according to Arlt, then transplants a piece of mucous membrane from the lips into the wound, and pulls the skin of the upper lid upwards with the aid of three sutures. PFALZ (465) makes an incision through the whole length of the lid, passing the knife in just above the insertion of the anterior row of eyelashes, holding the edge of the knife upwards and backwards, and then makes another, parallel to the former and about 3½ *mm* distant from it, and joining it at the ends with a sharp curve. The piece of skin thus circumcised with the muscle lying beneath it is excised. He then excises a wedge-shaped piece from the exposed tarsus, the blunt edge of which corresponds about to the greatest curvature of the tarsus, and then incises the conjunctiva in the middle of the wound to the extent of about 6 *mm*. After applying sutures he covers the wound with an iodoform bandage.

RANDALL (467) had operated twice upon a cyst which made the impression of a chalazion. A relapse occurred, so he extirpated the small tumor. Two years later there was another relapse, which necessitated the removal of the outer half of the lid. The tumor proved to be an encysted spindle-cell sarcoma.

VAN DUYSE and CRUYL (468) describe a case of myxosarcoma of the upper lid occurring in a girl seven years old. It was attributed to the blow of a whip, which had been received nine weeks before the removal of the tumor. The latter was removed on July 27, 1887, and weighed 80 *grms*. Almost the whole skin and conjunctiva were preserved. On October 6th, a rapidly growing relapse was noticed. MARCKWORT.

The cases of PHILLIPS (466) were those of two brothers, in whom the upper lid drooped in the opposite eye when looking to one side.

VIII.—LACHRYMAL APPARATUS.

470. FIEUZAL. Dacryolythe. *Bull. de la clin. nat. ophth. des quinze-vingts*, 1887, No. 3, p. 159.

471. FROST, A. Chronic enlargement of both lachrymal glands. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 112.

472. NOYES, H. D. Removal of prolapsed lachrymal gland. *Amer. Ophth. Soc.*, 1887.

473. RAMFOLDI e FARAVELLI. A proposito di talune malattie dell' apparato lagrimale. *Ann. di ottalm.*, vol. xvi., 4, p. 306.

474. STEAVENSON, W. E., and JESSOP, W. Remarks on electrolysis in the treatment of lachrymal obstruction. *Brit. Med. Jour.*, No. 1408, p. 1371.

FIEUZAL (470) extirpated a chalky concretion the size of a pea from the lachrymal region of a child fourteen years old.

FROST (471) describes a case of chronic enlargement of both lachrymal glands on a specific basis. The left became smaller, while the right continued to grow, so that finally it had to be removed.

NOYES (472) observed a swelling of the upper lid of the right eye, which had been increasing for nine years. It was movable upon the eyeball and accompanied all the movements of the latter. It was extirpated and proved to be the dislocated lachrymal gland.

RAMPOLDI and FARAVELLI (473) investigated the etiology and complications of affections of the lachrymal canal in 122 patients. The female sex was more frequently attacked than the male (78 among 122). In six of the women the disease had developed during pregnancy or lactation. Eighteen of the patients stood in the relation of parents and children, an occurrence which Rampoldi had repeatedly observed in his private patients, making the assumption of hereditary connection necessary. Twenty-eight patients had been affected with small-pox and had pterygia as a complication. In seven cases the pupil on the affected side was enlarged, in three contracted. DANTONE.

IX.—MUSCLES AND NERVES.

475. BJELOW. On the static and dynamic equilibrium of the eyes. *Wjestnik ophth.*, 1887, Nos. 3, 4, and 5.

476. BULL, C. S. Passive motion in the treatment of paralysis of the ocular muscles. *N. Y. Med. Rec.*, 1887, p. 151.

477. Burnett, S. M. Some thoughts on the etiology of squint. *N. Y. Med. Rec.*, Nov. 12, 1887.

478. Cuignet. Instruction théoretique et pratique sur l'appareil antistrabique. *Rec. d'ophth.*, 1877, No. 10, p. 577.

479. Emrys-Jones. Hemorrhage and proptosis after subconjunctival tenotomy of the external rectus. *Ophth. Soc. Unit. Kingd.*, Dec. 7, 1887.

480. Gräfe, A. The indicated position in operative treatment of paralytic deviations of the eye. *Arch. f. Ophth.*, vol. xxxiii., 3, p. 179.

481. Hinde, A. Periodically recurring oculomotor paralysis. *N. Y. Med. Record*, Oct. 22, 1887.

482. Hutchinson, J., Jun. Ophthalmoplegia. *Ophth. Soc. Unit. King.*, July 8, 1887.

483. Landolt, E. L'opération du strabisme. *Arch. d'ophth.*, 1887, No. 5, p. 409.

484. MacKinley, J. G. Paralysis of both external recti, probably congenital. *Trans. Ophth. Soc. Unit. Kingd.*, vol. vii., p. 298. Report of a case.

485. Masselon. Considérations générales sur le traitement chirurgical du strabisme. *Rec. clin. d'ocul.*, 1887, No. 11, p. 241.

486. Rohde, Richard. Paralysis of the ocular muscles. *Inaug. Diss.* Regensburg, 1887.

487. Snell, S. On dividing the rectus tendon from above in the operation for squint. *Brit. Med. Journ.*, p. 1379.

488. Stoeber. Pouvoir convergent binoculaire et angle métrique. *Semaine méd.*, 1887, p. 378.

489. Taylor, Ch. B. Operative treatment of squint. *Brit. Med. Journ.*, No. 1406, p. 1078.

490. Wadsworth, O. F. Recurrent paralysis of the motoroculi. *Amer. Ophth. Soc.*, 1887. Report of case.

Bjelow (475) examined, like Stilling, the position of rest of his visual lines in various ways, all the muscles of the eye being voluntarily relaxed, and found that for his slightly hypermetropic eyes the position of rest was divergence. Voluntary relaxation of the muscles can only be obtained by practice. It does not succeed soon after the eyes have been exerted, nor even after overcoming an adducting prism. He completely disproves Stilling's opinion, that when a distant object is fixed the covered eye remains in the position of rest. Neither does the position of the eye, under the gently closed lid, or during sleep, always correspond to the position of rest, the "static equilibrium." The results of Stilling would rather apply to the dynamic equilibrium. The author is convinced from his investigations that the position of rest of all eyes is always divergence (never convergence), while in fixation (dynamic equilibrium), as he and others before him have found, emmetropic and hypermetropic eyes have a tendency to converge, myopic eyes a tendency to diverge. The position of rest found by Jaesche he also discards: with a little practice the same conditions of distant vision are found when the plane of fixation is raised or depressed as when it is horizontal. The dynamic equilibrium (*i. e.*, the position of the eyes when in fixing an object binocular vision is prevented) is materially altered by the use of glasses. HIRSCHMANN.

BULL (476) practised the orthopædic treatment of paralyzed muscles recommended by Michel in twenty-one cases, and obtained in eight cases a complete cure, and in six marked improvement.

BURNETT (477) finds that convergent squint is twelve times more frequent in the white race than in the negro. As he finds no greater amount of ametropia in the negro, he is inclined to attribute the greater frequency of squint in the white race to a more firmly fixed habit of convergence among them. Until within a very few years the negro has never had to use his eyes for near work, whereas the white man has been doing it for generations. BURNETT.

EMRYS-JONES (479) observed in a girl ten years old a hemorrhage into Tenon's capsule after tenotomy of the internal rectus, followed by exophthalmus and amblyopia. The pupil was wide, and did not react; the optic disc was pale. Rapid improvement took place after the application of a compressive bandage.

When it becomes necessary to operate in paralysis of the ocular muscles, A. GRÄFE (480) recommends tenotomy of the internal rectus of the other eye in paresis of the external rectus with moderate limitation of the power of abduction. When there is a high degree of secondary convergence, with marked limitation of the power of abduction, advancement should be combined with it, the effect of which may be increased according to circumstances by abscising a piece of the tendon. In the very highest degrees of paralysis and secondary contraction, advancement and tenotomy on both eyes may become necessary. Paralysis of the superior oblique must be neutralized by tenotomy of the inferior rectus of the other eye. In the very rare cases of paralysis of the inferior oblique, Gräfe recommends tenotomy of the superior oblique of the other eye. In cases of isolated paralysis of the inferior or superior rectus, advancement of the weakened muscle is indicated.

HINDE (481) gives a full description of one of those rather rare recurrent paralyses of the third nerve, associated with amaurosis, hemianæsthesia, and hemiplegia, and he thinks that the most satisfactory explanation of the phenomena is by supposing that there is a lesion of the right cerebral cortex, with a steadily increasing area, spreading backwards to the occipital lobe, and reaching forward to the anterior and posterior central convolutions and paracentral lobule. The cause, he thinks, may have been an angio-neurosis. BURNETT.

HUTCHINSON, Jr. (482) reports on four cases of monocular paralysis of the oculomotor nerve, in which the autopsy was performed. In one of them the inflammation of the right cavernous sinus had caused a similar one of the nerves in its neighborhood. The affection was probably of syphilitic origin, as also in another case.

LANDOLT (483) suggests various methods of modifying the effect of an operation for strabismus, such as exercises of the amblyopic eye, correction of the anisometropia, prisms, the stereoscope, etc. In convergent strabismus he favors an operation on one eye only, tenotomy and advancement, except in alternating strabismus. In divergent strabismus of low degree, with good power of adduction, tenotomy of the external rectus of one or both eyes is sufficient. In marked deviation and feeble power of adduction, advancement and tenotomy of the squinting eye are indicated, sometimes tenotomy and advancement on the other also. In insufficiency of the internal recti, advancement is generally preferable. v. MITTELSTÄDT.

X.—ORBIT.

491. CORVENNE. Sarcome vasculaire de l'orbite. *Bull. de la clin. nat. ophth. des quinze-vingts*, 1887, No. 3, p. 160.

492. REEVE, R. A. Inflammation of the frontal sinus. *Canadian Practitioner*, May, 1887.

CORVENNE'S (491) case was that of a man aged 60, who noticed that the left eye began to bulge six months ago after being struck with a stone. The eye was totally atrophic and was dislocated downward and inward by a vascular melano-sarcoma, which filled the whole orbit. Two months after the exenteration, in which were included parts of the lachrymal and ethmoid bones, the orbit was filled with healthy granulations. v. MITTELSTÄDT.

REEVE (492) has had twelve cases of this disease under treatment. Of these ten were cases of chronic enlargement. Eight were men and four women. The disease had existed from a few months to thirty-five or forty years, and treatment had extended from a few weeks to twelve months. In four of the cases the origin was nasal catarrh; in four it was traumatism. In six of the cases the treatment was satisfactory. It consisted in opening the wall and drainage, most frequently through the nose.

BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

493. BULLER, F. A rare form of ophthalmia granulosa associated with ichthyosis. *Amer. Journ. Ophth.*, Dec., 1887.

494. FIEUZAL. De la galvanocaustic dans les granulations conjonctivales et les infiltrations cornéennes. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts*, 1887, No. 3, p. 155.

495. HOTZ, F. C. The treatment of hypopyon keratitis with frequent irrigations of corrosive sublimate. *Journ. Amer. Med. Assoc.*, Dec. 17, 1887.

496. LJWOW, J. The question of the prevention of blennorrhea neonatorum. *Diary of the Kasan Med. Assoc.*, 1887, Nos. 8 and 9.

497. RAEHLMANN, E. On the histological structure of trachomatous pannus. *Arch. f. Ophth.*, vol. xxxiii., 3, p. 1.

498. STADERINI. Il sublimato corrosivo nella cura della congiuntivite granulosa. *Morgagni*, vol. xxix., 1887.

499. TALKO, J. Lipo-chondro-adenoma conjunctivae bulbi. *Wjestnik Ophth.*, 1887, Nos. 4 and 5.

500. WASCHEJEWSKY, E. The etiology and treatment of trachoma. *Wojeno med. Jour.*, Oct., 1887.

BULLER (493) relates two interesting cases of granular condition of the conjunctiva associated with ichthyosis, and differing in many essential particulars from trachoma. The granulations are hard and rebellious to treatment, there is no tendency to inflammatory exacerbations, and the disease is not contagious. The secretion resembles that of beginning parenchymatous xerosis.

BURNETT.

FIEUZAL (494) recommends the galvano-cautery in granular conjunctivitis, especially when other methods have failed.

HOTZ (495) has tried irrigation with the sublimate solution (1 : 5,000) in twelve cases of hypopyon keratitis and with success. In twenty-four hours after the treatment was begun the hypopyon began to diminish in size. The flooding of the eye was made every hour at first, gradually increasing the interval as the hypopyon subsided. BURNETT.

LJWOW (496) found gonococci in more than half the women he examined, though there were no traces of blennorrhœa. He uses a 1–1½ % solution of nitrate of silver, and got just as good results as with a 2 % solution. Of 914 children treated not one got blennorrhœa. He believes that the solution merely washes out the conjunctival sac, and that probably the same result can be obtained with other liquids. HIRSCHMANN.

RAEHLMANN (497) finds that the first signs of pannus consist in a collection of lymph cells in the corneal tissue beneath Bowman's membrane. Blood-vessels then form in this layer. Subsequently a tissue is found under the anterior limiting membrane which possesses the properties of adenoid tissue. It contains numerous young blood-vessels, lymph vessels filled with white blood corpuscles, and lymph spaces. Next little abscesses form which soon develop into superficial ulcers, which, however, heal rapidly. Typical follicles are discovered, not only superficially, but also in the depth of the tissue. A peculiar kind of connective tissue is formed at an early date in this adenoid tissue. The affection is a true trachoma of the cornea.

STADERINI (498) considers sublimate a specific against trachoma. He brushes a solution, 1 : 300 or 1 : 500, upon the inverted lids, and washes out the eyes every two hours with a lukewarm solution of 1 : 7,000. DANTONE.

WAŠCHEJEWSKY (500) found that trachoma may be transmitted, not only through trachomatous secretion, but also through that of chronic gonorrhœa. The cocci of the latter closely resemble those of trachoma. He also investigated the effect of various disinfectants on the trachoma-cocci. They were sulphate of zinc, salicylate of sodium, boric acid and iodide of potassium (all in 1–10 % solutions), nitrate of silver, glacial acetic acid, and carbolic acid (1–3 % solutions), permanganate of potassium (1–5 %), concentrated muriatic acid ($\frac{1}{2}$–2 %), corrosive sublimate (1 : 8,000–1 : 2,000), 1 part of pure iodine and two of iodide of potassium to 5,000 of water, to $\frac{1 I + 2 KI}{2000}$. The solutions were permitted to act from 1 to 40 minutes. The solution of iodine with iodide of potassium, $\frac{1-2}{3000}$, acted quickly, destroying the vitality of the cocci in five minutes. He accordingly tried it on patients and obtained excellent results. HIRSCHMANN.

501. KAZAUROW. The thermo-cautery in ophthalmology. *Wjestnik Ophth.*, 1887, No. 6.

502. ROSMINI. Sopra un caso di cherato-plastica eseguita mediate innesto di una cornea di coniglio in un individue che ebbe distrutte le cornee della esplosione di un mina. *Gazz. med. Ital.*, 1887, No. 17.

503. SCHÖLER, H. Contribution to the xerotic affections of the cornea, introducing a new form of the disease hitherto not observed by me, the result of an abstinence cure. *Berliner klin. Wochenschr.*, 1887, No. 52.

504. VERDESE, A. Contribution à l'étude de l'anatomie de l'ulcus serpens. *Arch. d'ophth.*, 1887, No. 6, p. 526.

KAZAUROW (501) recommends the thermo-cautery in trichiasis; also for destruction of the lachrymal sac and for corneal staphyloma. In trichiasis he passes the glowing iron along the ciliary margin 2 *mm* from its edge through the skin and even into the tarsus. The results were good, but some of the lashes were destroyed.

In cases of dacryocystitis and ozæna, he recommends destruction of the lachrymal sac before operating for cataract. In corneal staphyloma he perforates it at the most prominent point. There were no injurious consequences. HIRSCHMANN.

ROSMINI (502) transplanted a cornea from a rabbit to a man according to a method devised by Gradenigo, but the result was not entirely satisfactory, as the cornea had become diffusely hazy after two weeks. DANTONE.

SCHÖLER (503) observed a peculiar affection in persons belonging to the wealthier classes, the symptoms of which somewhat resembled those of xerotic conjunctivitis. It occurred in persons whose nutrition had been stinted. The conjunctiva was dry, lustreless, and wrinkled, the cornea partly denuded of epithelium, and the patients had a sensation of dryness. The disease passed from one eye to the other, and had a tendency to relapses. It was attributable to improper nourishment, too small consumption of liquid, and too much of nitrogenous food.

VERDESE (504) reports on an interesting case of serpent corneal ulcer. It was about 2 *mm* in extent, began at the upper corneal margin with a sharp edge, passed through about one third of the cornea, and then slowly merged itself into the level of the latter. There is no epithelium to the extent of several millimetres around the ulcer. Bowman's membrane is considerably thickened at the upper margin of the ulcer, and the corneal lamellæ around it are partially necrosed. The whole corneal tissue, especially near the ulcer, was densely infiltrated with lymph cells. Fontana's space and the ciliary body were filled with wandering cells. The iris was almost normal. No micro-organisms were found. This observation shows that the cornea is directly implicated in the formation of hypopyon by perforation of Descemet's membrane, which takes place before the ulcer has penetrated all the layers of the cornea. V. MITTELSTÄDT.

Sections XII.–XXI. Reviewed by DR. NIEDEN.

XII.—IRIS.

505. GALEZOWSKI. Aniridie traumatique avec luxation du cristallin. *Rev. d'ophth.*, Nov., 1887, p. 642.

506. MULES. Solitary gummatous tumor of the iris. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 148.

507. ZIEM. Iritis in suppuration of the nose and neighboring cavities. *Centralbl. f. Augenhk.*, vol. xi., p. 358.

GALEZOWSKI (505) describes a case of traumatic complete iridodialysis. Some time after the patient had been hit with a waterpot Galezowski discovered that the whole iris had disappeared. At a point behind the limbus corneæ a grayish-red, oblong spot was visible, resembling a small hemorrhage. Galezowski considered this the remnant of the rolled-up iris. The lens was partially dislocated and partially cataractous. To ripen the cataract, and later on account of the secondary cataract, two discissions were made, enabling the patient, with the aid of + 16, to read No. 7 of Galezowski's test-types. The optic nerve, choroid, and retina proved to be uninjured. MARCKWORT.

MULES (506) reports a case of solitary tubercle of the iris in a child aged thirteen months, which showed no symptoms of iritis or hereditary syphilis. The growth was dispersed by mercurial inunction in seven weeks. WERNER.

ZIEM (507) again calls attention to the close connection between affections of the eye and nose, in connection with the report of three cases of iritis in suppuration from the nose and its neighboring cavities, and believes that he can easily explain the direct transmission of a metastatic suppuration from one cavity to the other on the basis of the vascular connections between the eye and orbit on one side, and the nose and its neighboring cavities on the other.

XIII.—CHOROID.

508. COGGIN, D. A case of neurotomia optico-ciliaris. *Amer. Journ. Ophth.*, Nov., 1887.

509. LAWFORD, J. B. Cases of intraocular sarcoma. *Royal London Ophth. Hosp. Rep.*, vol. xi., 4, p. 400.

510. SARTI. Sarcoma melanotico della coroide. *Riv. clin.*, vol. xxvi., 5, p. 340.

COGGIN'S (508) patient was a woman who had iridocyclitis and refused enucleation. He did an optico-ciliary neurotomy, and eight and a half years afterwards the relief was still manifest.

BURNETT.

LAWFORD (509) records 19 (29 ?) cases of intraocular sarcoma excised at Moorfield's Hospital during three years from June, 1884, to June, 1887. There were 14 males, 15 females. Average age of all, 51. The youngest patient was a female, æt. 33. Local recurrence took place certainly in two cases, and also in two there were metastases. A family history of tumor was present in two cases. In four cases the sarcoma originated in eyes previously blind from other causes, and in five cases there was history of injury with a long interval previous to symptoms of new growth. The tension was increased at the time of excision in eleven, doubtful in one, normal in five, and two were shrunken eyeballs. In one case sympathetic ophthalmia was excited in the sound eye.

WERNER.

SARTI (510) describes a round-cell melanosarcoma the size of a hen's egg, which sprang from the choroid and had filled the whole orbit. Neither the neighboring lymph-glands nor any other organ of the body was affected ; two months after the extirpation there was no sign of a relapse in the orbit, but the submaxillary and preauricular glands were hard. DANTONE.

XIV.—GLAUCOMA.

511. De Lapersonne. Diagnostic et traitement du glaucome. *Rev. génér. de clin. et de thérap.*, pp. 465, 497.

De Lapersonne (511) recommends the following methods of treatment in the various forms of glaucoma : g. acutum : iridectomy ; g. subacutum : myotics, eventually sclerotomy, and if this fails, iridectomy ; atrophic glaucoma (Donders) : sclerotomy, though with slight chances of success ; g. secundarium : different methods, dependent upon the case, generally iridectomy.

XV.—SYMPATHETIC OPHTHALMIA.

512. Cross, F. R. Sympathetic ophthalmitis occurring after evisceration. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 149.

513. Hobby, C. M. Sympathetic ophthalmia. *Journ. Amer. Med. Assoc.*, Oct. 22, 1887.

Cross (512) records two cases of sympathetic ophthalmia occurring after evisceration. In each case artificial vitreous bodies were inserted. Enucleation he considers superior to evisceration, as it more thoroughly removed the exciting disease and tended to resolution of the morbid process without delay. A septic fistula might result from imperfect inclusion of the artificial vitreous.

Werner.

In 300 cases of traumatism of varying kinds to the eye, Hobby (513) has found 35 cases in which the fellow-eye was lost. In 36 cases enucleation was performed during sympathetic irritation or inflammation, and in 5 cases the enucleation was made during a state of panophthalmitis. The period intervening between primary injury and affection of the other eye was less than a month in 22 cases ; one to three months in 7 ; three months to a year in 3 ; after a year in 33 ; the shortest time being two weeks and the longest forty years. He has had 2 cases of death following enucleation during panophthalmitis. Other valuable statistics are given.

Burnett.

XVI.—LENS.

514. Alt, A. Some remarks on congenital cataracts. *Amer. Journ. Ophth.*, Dec., 1887.

515. Bogajewsky. Short report on 173 cataract operations done at the hospital at Krementschug. *Wjestnik Ophth.*, 1887, No. 6. Good results, 70 %; loss, 8 %.

516. Montgomery, W. F. After-treatment of cataract-extraction. *Journ. Amer. Med. Assoc.*, Dec. 24, 1887.

517. Rampoldi e Faravelli. Le operazioni di cataratta eseguite durante l'anno scolastico 1886–87 e il sublimato corrosivo. *Ann. di ottalm.*, vol. xvi., 4, p. 318.

518. Schiskin, J. Cataract of both eyes after a stroke of lightning. *Protok. of the Caucas. Med. Assoc.*, 1887, vol. xxiv., No. 10.

519. Thompson, J. L. Observations on displacement of the crystalline lens from congenital and other causes. *Journ. Amer. Med. Assoc.*, Nov. 20, 1887.

520. Valk, Francis. Report of four operations for removal of cataract without an iridectomy, and by an entirely new method. *Journ. Amer. Med. Assoc.*, 1887.

521. Vian. Des progrès accomplés dans le traitement chirurgical de la cataracte et du procédé de choix. *Rec. d'ophth.*, Dec. 17, 1887. (History of cataract operation ; to be continued.)

Alt (514) gives a short *résumé* of thirty-seven operations for congenital cataract done on twenty-six patients. Of these, eleven had zonular cataract in both eyes ; ten total cataract (two shrunken) ; one pyramidal in both ; one shrunken in one and zonular in the other ; one total in one eye alone. The operation generally was that of discission and without an iridectomy. Sometimes a hard nucleus was removed by extraction. The age of the patients varied between one and a half and twenty-seven years.

Burnett.

Montgomery (516) does not use isinglass-plaster for closing the lids after cataract-extraction, but a light gauze bandage. He closes only one eye and allows the patient to sit up and walk around. In twenty cases thus treated he has had no unfortunate results.

Burnett.

Since the spring of 1886 Rampoldi (517) has used corrosive sublimate in all his operations as an antiseptic. Among 106 extractions (most of them according to Gräfe) the author had only two failures, which strictly cannot be set down as such, as there are chances of obtaining some sight by an iridectomy. Dantone.

Schiskin (518) observed in a boy aged eleven, who had lost consciousness after a stroke of lightning, many characteristic burns, and found when consciousness returned that he was totally blind. His treatment began on the sixth day. Schiskin found the lids swollen, no perception of light, lenses opaque (bluish white, with radiating spokes). On the ninth day perception of light returned. Two months later the condition of the eyes had not changed. HIRSCHMANN.

THOMPSON (519) reports in more or less detail the histories of twelve cases of congenital dislocation of the lens, and concludes that heredity plays an important part; that it is a dangerous anomaly in so far as it leads to progressive dislocation, cataract, and glaucoma; that the myopia of such cases is due to the malposition of the lens, forming some of the cases of "second sight" in old people; that spontaneous dislocation is due to congestion and subacute inflammation of the uveal tract, and occasionally results in spontaneous cure of cataract by absorption. BURNETT.

VALK'S (520) new method consists in using an iris-retractor to assist in the expulsion of the lens. The instrument resembles an iris-forceps with a small hook in the end of the blades, and with a crossed action, allowing the blades to be held apart by pressure of the fingers. BURNETT.

XVII.—VITREOUS.

522. ZIEMINSKI. Apoplexie générale du corps vitré chez les adolescents. *Rec. d'ophth.*, December, 1887, p. 709. (Discussion of the hemorrhages into the vitreous, especially in regard to the diagnosis. To be continued.)

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

523. BARUCH, S., and PECK, E. S. An interesting case of hysterical amblyopia in the male. *N. Y. Med. Record*, Nov. 19, 1887.

524. BOUVERET. Observation de cécité totale par lésion corticale. *Rev. génér. d'ophth.*, 1887, No. 11, p. 481.

525. Discussion at the special meeting held on June 23d to collect facts in reference to toxic amblyopia. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., pp. 35 ff.

526. DUBOIS DE LAVIGERIE. Accidents oculaires produits par l'inhalation du sulfure de carbone. *Rec. d'ophth.*, September, 1887, p. 525.

527. FROST, W. A. Abnormal course of a branch of the arteria centralis retinæ. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 175.

528. Hinde, Alfred. A case of right lateral or homonymous hemianopsia, with negative history. *N. Y. Med. Record*, Dec. 17, 1887.

529. Magnus. A further contribution to the knowledge of congenital, immediate, grayish-white opacity around the fovea centralis. *Zehender's klin. Monatsbl.*, vol. xxv., p. 375.

530. Nettleship, E. On some of the forms of congenital and infantile amblyopia. *Ophth. Hosp. Rep.*, vol. xi., 4, p. 353.

531. Nettleship, E. Acute temporary amblyopia whilst taking small doses of quinine; history of a previous attack, patient intolerant of quinine. *Ophth. Hosp. Rep.*, vol. xi., 3, p. 218.

Baruch and Peck (523) report the case of a man twenty-one years of age, who had amblyopia, diplopia, and hemiæsthesia, which were of undoubted hysterical origin. He was an epileptic. Under treatment directed to building up his nervous system all the symptoms disappeared. Burnett.

Bouveret (524) reports a case of sudden total blindness, the cause of which at the autopsy proved to be softening of the cortical layer of the medial surface of both occipital lobes, which had been caused by thrombosis of the arteries in question. Similar cases are reported by Seguin (Contribution à l'étude de l'hémianopsie d'origine centrale). *Arch. de neurol.*, March, 1886.

Marckwort.

A special meeting (525) was held on June 23d to collect facts in regard to toxic amblyopia, especially as regards the following points: (1) Cases of true alcoholic amblyopia; (2) cases of recovery, without complete discontinuance of the poison; (3) cases of complete persistent pallor of the disc; (4) do second attacks ever occur?

Nettleship had never seen a case of amblyopia in drinkers who did not smoke, or a case of perfect recovery without a diminution in the allowance of tobacco. He read notes of cases illustrating the following points: Improvement may take place if tobacco be stopped, although alcohol is continued; amblyopia is generally due to use of tobacco for many years, but may be caused by very small quantities, *e. g.*, less than one ounce per week; it implies probably an idiosyncrasy of the nervous system. He had seen only one example of relapse. Eales' experience on the whole coincided with Nettleship's. He considered central scotoma for colors absolutely characteristic of tobacco amblyopia.

He never saw atrophy of the disc or blindness supervene. Hutchinson, Jr., mentions seven cases in which there was a scotoma for yellow, and one case of central scotoma for blue. Gunn never saw amblyopia in non-smokers ; he records a case of recovery with almost perfect vision, but persistent pallor of the entire optic disc. Stanford Merton never saw amblyopia in a non-smoker. He records one case of persistent pallor of the disc and one of central scrotoma for blue. Edmunds and Lawford record a case of axial neuritis in chronic alcoholism, with microscopic examination of optic nerves. Frost records five cases of amblyopia without central scotoma. Hill Griffith gives statistics of sixty-five cases, and concludes that speedy recovery only ensues when the toxic agent is completely given up. He had seen two cases of relapse. Out of one hundred and seventy cases there was not one in which the whole surface of the disc became white. Fourteen of the cases of toxic amblyopia occurred in women. The youngest case of toxic amblyopia seen by Berry was twenty years old. He had seen several cases in total abstainers, but never could exclude tobacco. He thought that if $V < \frac{20}{200}$ and the scotoma reached the inner side of the point of fixation, recovery would not take place. C. Shears gives an analysis of fifty-six cases, no case of alcoholic amblyopia, one relapse, no case of complete persistent pallor of the disc. Werner.

D. de Lavigerie (526) describes two cases of chronic intoxication with bisulphide of carbon. The symptoms consisted particularly in headache, dizziness, cramps in the legs, pain in the limbs, and diminution of sight (counting fingers at 10 ft.). The field of vision was somewhat contracted for red and green but not for white and blue. There were no scotomata. The papillæ were very pale, but the blood-vessels were of normal calibre. The patients had been exposed while at work to the fumes of bisulphide of carbon. When they were obliged to give it up on account of their poor sight, their condition improved, while it became worse as soon as they took up work again.

Marckwort.

Frost (527) gives an illustration of a case in which a vessel equal in size to the arteria centralis emerged from the disc, projected into the vitreous and then bifurcated, each division dipping into the disc again close to the point of exit of the parent trunk. The most prominent part of the vessel was visible with + 10 D. Werner.

HINDE'S (528) case was that of a man aged 57, who noticed a gradual blurring of the right half of the visual field, going into complete hemianopsia in the course of two months. Patient in perfect health and no hereditary or acquired taint. Two years ago he was struck on the left temple with a whiskey-bottle.

BURNETT.

MAGNUS (529) adds another case of congenital whitish-gray opacity surrounding the macula lutea to the three already described (the author, Goldzieher and Knapp), observed in a child 1½ years old with rotary nystagmus. The fovea centralis was of a cherry-red color. A year later the appearance of the fundus had become normal, the nystagmus had disappeared, and central had taken the place of eccentric fixation.

NETTLESHIP'S (530) paper is a very long one. It contains reports of cases illustrative of the following groups. 1. Infantile amblyopia from syphilitic choroido-retinitis and hyalitis. 2. Microcephalous infants with gross choroiditis, apparently not syphilitic. 3. Failure of sight without papillitis, coming on during an illness diagnosed as meningitis. 4. Infantile blindness, without meningitis and little or no ophthalmoscopic changes ; more than half are idiotic. In some children blind from birth pupils may react to light. He next considers amblyopia in older patients, under the following heads : 5. Amblyopia with ametropia and sometimes nystagmus. The pedigree is given of a family in which the blue-eyed males alone were affected. 6. Albinos with amblyopia and nystagmus. 7. Cases of night-blindness differing from retinitis pigmentosa in their pathological associations. The ophthalmoscopic changes consist in irregularity of pigment epithelium and scattered minute white dots. In one case 22 members of the family, all males, were affected, and 16 of them inherited through the mother. 8. Cases of congenital day-blindness, with amblyopia, and color-blindness (usually for all colors). Lastly amblyopia of one eye with or without ametropia or squint is discussed. Facts and considerations are brought forward to show that neither of the two theories of amblyopia ex anopsia nor amblyopia from congenital imperfection has as yet been fully established. WERNER.

NETTLESHIP'S (531) patient recovered almost completely, but the color-field remained contracted. WERNER.

XIX.—OPTIC NERVE.

532. FROTHINGHAM, GEO. E. Two cases of tumor of the optic nerve. *Journ. Amer. Med. Assoc.*, Dec. 10, 1887.

533. HIRSCHBERG, J. On idiopathic inflammation of the optic nerve. *Centralbl. f. Augenhk.*, vol. xi., p. 321.

534. JACOBSOHN, E. Report of cases of congenital atrophy of the optic nerve. *Centralbl. f. Augenhk.*, vol. xi., p. 362.

535. EDMUNDS and LAWFORD. On optic neuritis in head injuries. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 208.

Both of FROTHINGHAM'S (532) cases occurred in young people, one a lad of 7, the other a girl of 17. In both the eyes were enucleated with the tumors. In one case there was a papillitis, in the other not. In the case of the boy the tumor involved the entire substance of the optic nerve from the foramen to the globe, was 1$\frac{5}{8}$ in. in its long and 1$\frac{1}{16}$ in. in its short diameter. In the other case it was not quite so large, and the ocular end of the nerve was free for about half an inch. Both were round-celled sarcomas. No return to date. BURNETT.

HIRSCHBERG (533) reports four cases of retrobulbar neuritis in relatively young people, of spontaneous origin, and thinks he should call attention to three well defined periods in its course: the first and shortest is marked by great diminution of vision and negative ophthalmoscopic appearance; the second and longer one by gradual loss of sight and distinct inflammation of the papilla; the third and permanent one by almost complete recovery with well defined pallor of the disc without any inflammatory indistinctness.

EDMUNDS and LAWFORD (535) collected 24 cases of head-injuries, and show that optic neuritis occurs much more frequently when the base of the skull or brain is involved. Optic neuritis occurred only twice in 8 cases in which the base was thought to be free, while in 16 cases in which the base was believed to be involved it occurred in 10. WERNER.

JACOBSOHN (534) reports two cases of congenital atrophy of the optic nerve in two children of healthy parents, the other four children not being affected. The papilla was of a grayish-white color, of normal size, with slightly indistinct edge, and surrounded by a bright whitish scleral ring of about half the diameter of the papilla. The blood-vessels are of normal size and well filled. Evidently a pathological change had taken place during uterine life, which had destroyed the fibres of the optic nerve.

XX.—INJURIES; FOREIGN BODIES (PARASITES).

536. HUGHES, HENRY. The cause and manner of rupture of the sclera and choroid. With 24 woodcuts. *v. Gräfe's Arch. f. Ophth.*, vol. xxxiii., 3, p. 21.

537. Mules, P. H. A case of double auto-extraction. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 296.

538. Mules, P. H. Posterior scleral rupture. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 298.

539. Mackinlay. Complete self-enucleation of eyeball. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 298.

540. Saltini. Sopra un caso di cisticerco nel vitreo. *Rassegna di scienze med.*, vol. ii., 9.

After describing one of the rare cases of horizontal rupture of the choroid, Hughes (536) reviews at length the whole literature of scleral and choroidal rupture. The former are generally situated at the upper and medial side (73 %), less frequently (27) at the lateral side of the scleral margin, and have never been observed at the posterior section of the globe. Ruptures of the choroid are generally situated on the temporal side (59 %), rarely on the nasal side (10 %), very seldom (4 %) they extend horizontally. The cause of this typical position is found in the fact that the scleral margin is strained when the eyeball assumes the spherical form, as it is the only zone of the globe which under normal conditions presents a concavity outwards. When this strained part coincides with the fold caused by the traumatism, the rupture must take place at that point. As the majority of foreign bodies, according to the author, strike the eyeball from below and outward, the rupture generally occurs at the upper and nasal portion of the scleral margin. As in choroidal ruptures the blunt force acts upon the eyeball from below and outward, the latter turns inward, and that portion lying laterally from the entrance of the optic nerve is stretched. The rupture passes between the papilla and the macula, and is concentric with the entrance of the optic nerve. When the eyeball is struck from above or below, the tension takes place in a vertical direction, and the portion between the macula and papilla, being immovable on account of its attachments, is subjected to the greatest strain, so that a horizontal rupture is the result. As to the mechanical explanation, see the original. A carefully compiled bibliography is added.

In Mules' case (537) the lenses were removed by injuries, with V ultimately $= \frac{6}{12}$ and $\frac{6}{24}$ on correction. Werner.

In the case reported by Mules (538) the front of the eye was uninjured, and the media transparent, but the papilla was forced out together with an irregular margin of sclera. Werner.

SALTINI (540) observed in a young woman aged twenty-nine, a cysticercus of the vitreous situated near the posterior pole of the lens, the movements of which could be readily seen, even with the naked eye, under oblique illumination when the pupil was dilated. This condition had existed thirteen months, and had begun with symptoms of severe irritation, which, however soon disappeared, and simply left her vision dim. Subsequently the patient was twice attacked with convulsions, but no changes took place in the eye. An operation was refused. The author thinks it was the first case observed in Emilien. DANTONE.

XXI.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

541. BERRY, G. A. On ocular symptoms in cases of cerebral diseases. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 308.

542. BROTZU. Studio clinico sperimentale sulla deviazione conjugata degli occhi. *La Spallanzani*, vol. xvi., 7, p. 308.

543. LAUTENBACH, LOUIS J. General conclusions derived from the study of the eyes of 1,000 insane patients. *Med. News*, Oct. 22, 1887.

544. LANG, W. Case of meningitis after excision. *Trans. Ophth. Soc. Unit. Kingd.*, 1887, vol. vii., p. 319.

545. PANAS. Des manifestations oculaires de la lèpre et du traitement qui leur convient. *Arch. d'ophth.*, 1887, vol. vii., No. 6, p. 481.

546. RAMPOLDI. Cause rare di astenopia di accommodazione. *Ann. di ottalm.*, vol. xvi., 4, p. 270.

547. RAMPOLDI. Contributo alla genesi dell' enoftalmo. *Ann. di ottalm.*, vol. xvi., 4, p. 276.

BERRY (541) records three cases: 1. Acute ophthalmoplegia externa in a girl æt. two and a half years. There was a history of headache and a screaming-fit. Scrofulous disease of one finger. There was distinct improvement under iodide of potassium. The author diagnosed probable tubercular disease of the nuclei, but Gowers thought thrombosis more probable. 2. Megrim associated with spasm of convergence in a girl of eighteen. Extraordinary abnormalities of the bodily temperature were observed. Suspicion of hysteria. 3. Recurrent attacks of bitemporal hemianopsia, with headache and drowsiness, in a man æt. fifty-three. Six attacks occurred. The field was defective to within 5° of the fixation points. WERNER.

BROTZU (542) describes a case of conjugate deviation of both eyes accompanying paralysis of the facial nerve, torsion of the head, and convulsive contraction of the muscles of the neck in a boy of sixteen, of feeble build but otherwise healthy. All of these symptoms disappeared in the course of three months. The author also reports at length on twelve experiments made by Angelucci on dogs, to determine the exact location of the nerve-centre controlling conjugate deviation. DANTONE.

LAUTENBACH (543) found that in the insane the vision for form was practically as in the sane. V.F.F. were often reduced in consequence of nerve-degeneration, pupils more frequently irregular than in the sane. Insufficiencies of the recti frequent in imbeciles and idiots. In acute melancholia there is a congestion of the fundus. In epilepsy there is a tendency to nerve-degeneration and in some cases to retinal effusions. BURNETT.

In LANG'S (544) case there was panophthalmitis and the sclerotic was wounded during excision. Symptoms of meningitis set in the following day, and he died the next. Post-mortem extensive suppurative meningitis was found. The contents of the orbit were examined microscopically. WERNER.

RAMPOLDI (546) mentions several interesting cases of accommodative asthenopia not dependent on hypermetropia; so in hysteria, neuralgias of the fifth nerve, and other more distant ones; also in caries of the teeth. A young man became asthenopic after he had been operated by orcheotomy; another, after he had taken chloroform internally on account of persistent hiccough; in this case there was also slight mydriasis. Finally, the author mentions a patient who had asthenopic symptoms, as soon as he tried to read while in a warm bath. DANTONE.

RAMPOLDI (547) observed in three cataract patients internal hæmophthalmus, after the patients had been greatly excited by the visit of relatives and had cried. In another patient, who had been operated six days previously, and had an iritis, the author observed the hemorrhage 6–10 hours after the heavy hair had been cut off. DANTONE.

PANAS (545) cured two patients suffering with tubercular leprosy of the sclero-corneal margin by extensive excision and subsequent application of carbolic acid and iodoform salve. He prefers this treatment to simple marginal keratotomy, which he does not consider sufficiently energetic. He describes the appearance of leprous ocular affections in anæsthetic leprosy, which leads to blindness by lagophthalmus, xerosis of the cornea, in rare cases also by iritis and cataract, or phthisis, and also the tubercular form, which attacks the cornea from the limbus, extends to the iris and choroid, and also destroys sight.

V. MITTELSTÄDT.

MISCELLANEOUS NEWS.

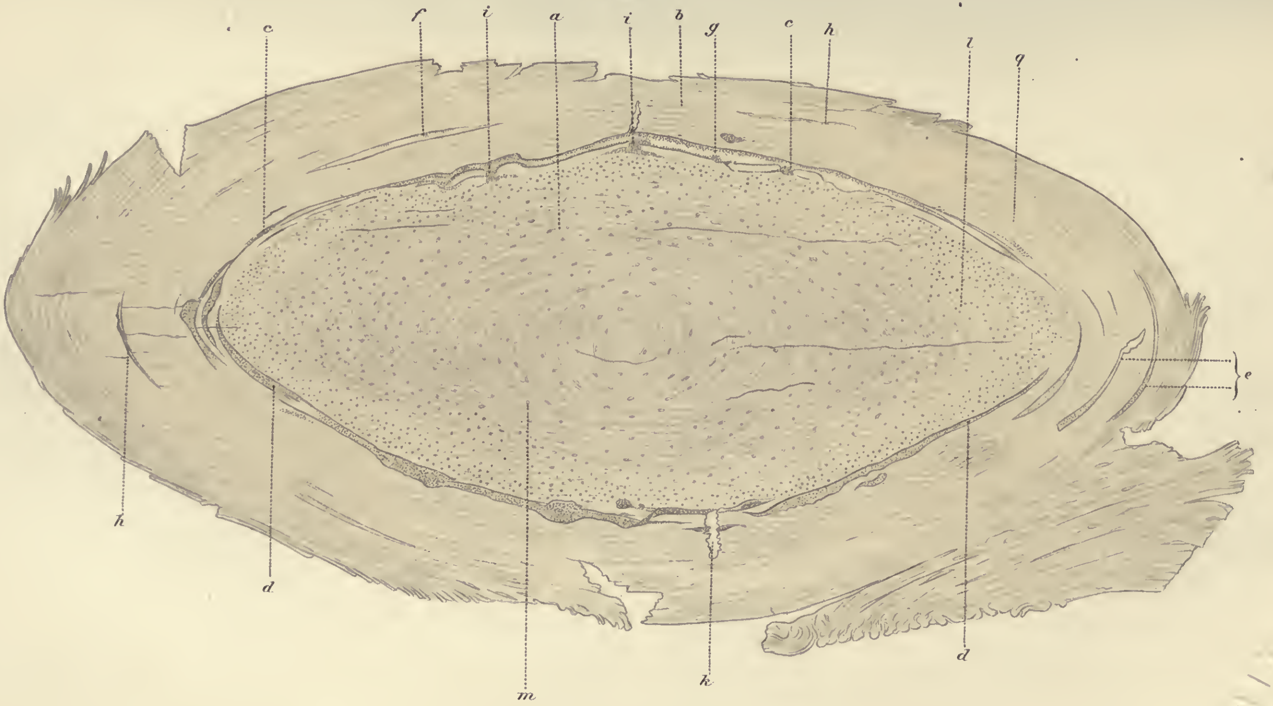
The next (8th) **International Ophthalmological Congress** will be held at Edinburgh, Scotland, in six years. Committee of organization : **Arg. Robertson** and **Berry**.

Dr. **Fieuzal**, ophthalmic surgeon to the Clinique Nationale Ophthalmologique des Quinze-Vingts, is dead. He was a man in the prime of life, of high scientific attainments, great practical ability, and indefatigable industry. We are informed that Drs. **Abadie** and **Trousseau** have been appointed as his successors.

Dr. C. **Horstmann** has been appointed extraordinary professor of ophthalmology in the University of Berlin.

Dr. H. **Knapp** has been appointed professor of ophthalmology at the College of Physicians and Surgeons in the City of New York. His successor at the Medical Department of the University of the City of New York is Dr. C. S. **Bull**.

Fig. 1.



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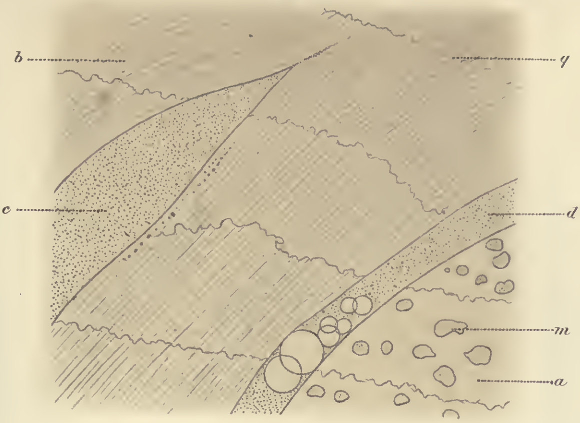

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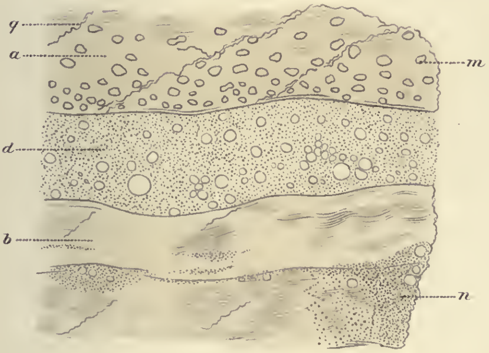

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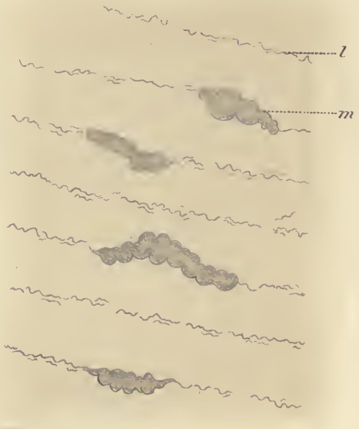

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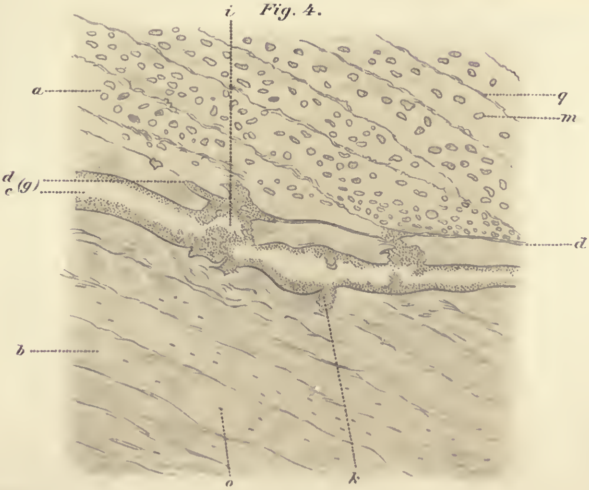

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NOTICE TO OUR READERS.

The Archives of Ophthalmology contain *original papers* on all branches of ophthalmic surgery, and *original reports* on the progress of ophthalmology. The original papers occupy from two thirds to three fourths of the space, and their scope embraces all subjects of scientific and practical interest connected with this department of medicine.

The object of the Archives is to guard, solidify, extend, and diffuse the stock of acquired ophthalmic knowledge by recording the constant addition of new observations, investigations, methods and means of examination, clinical experience, instruments and remedies, and further by taking part in the discussion of the questions of the day with a spirit alike conservative and progressive.

Particular attention is paid to the preparation of the Report on the Progress of Ophthalmology. The report is intended to furnish a *complete, systematic, and early* review of the current ophthalmological literature of the world. It has been necessary to divide the work of its preparation among a number of collaborators according to the following arrangement :

Dr. H. Magnus, professor at the University of Breslau (22 Tauentzien Strasse) :

1. *General Ophthalmological Literature :*
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   b.—Monographs and papers on historical, statistical, and general subjects ; reports on societies and hospitals.
   c.—Periodicals on our specialty (short notices of their character, time and place of publication, the titles of the original papers, with the names of their authors).

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2. *Eyelids.*
3. *Lachrymal Apparatus.*
4. *Muscles and Nerves.*
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2. *Refracting Media,* including the lens.
3. *Retina and Optic Nerve.*
4. *Injuries and Foreign Bodies of these parts.*
5. *Ocular affections in connection with general diseases.*

In order to obtain complete and recent reviews on the non-German ophthalmological literature, special reporters have been selected for different countries, who will send monthly abstracts of all local ophthalmological publications to Dr. C. Horstmann, of Berlin, the editor of the Report. Dr. Horstmann will distribute these abstracts among the German reporters according to the above plan, in order to preserve the systematic arrangement, which we think of paramount importance.

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For Italy: Dr. Dantone, Rome.

For Russia: Prof. Hirschmann, of Charkow.

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In the interest of our readers, who are scattered over the whole world—and whom, like ourselves, we desire to keep informed of all advances in ophthalmology,—furthermore in their own interest, authors of ophthalmological works are requested to send reprints, duplicates of journals, or copies for reviewing, to one of the above-named reporters, or to the editors or publishers of the Archives, according to their convenience.

The abstracts of American ophthalmological literature formerly appeared under a special head, but are now embodied in the systematic Report. Text-books may be specially noticed.

The number of good papers offered us for publication has increased to such an extent that it is no longer possible to translate all of them unabridged. Whenever a German paper is condensed in the English version, or *vice versa*, it will be so stated. Should any one of our readers wish to recur to the original, the editors will always take pleasure in sending it for reference.

Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the Archives, and are solicited.

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The editors and publishers of the ARCHIVES beg to offer some suggestions to authors who propose to favor them with their contributions.

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c. Draw a line along the margin of such paragraphs as should be printed in smaller type—for instance, all that is clinical history in reports of cases, etc.

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VOL XVII. No. 4.

ARCHIVES OF OPHTHALMOLOGY.

A CASE OF GLIOMA OF THE PONS (BEARING UPON THE QUESTION OF NUCLEAR PARALYSIS AND THE GENESIS OF CHOKED DISC.

BY PROF. H. SCHMIDT-RIMPLER, OF MARBURG.

Translated by Dr. H. A. B. MACCAULEY, of New York.

(*With* 4 *drawings*.)

IN many cases, bilateral implication of the same pair of ocular nerves, such as the abducens or oculo-motorius, would lead us to think of an affection of the nerve nuclei.

This supposition is strengthened if changes in the degree of the paralysis are noted, as such variations are seldom observed in paralysis due to interruption or interference with the conducting nerve fibres, in direct contradistinction to those of central origin.

Mauthner writes[1]: "A bad wire always shows the same degree of poor conduction,"—an aphorism, however, to which there are many exceptions. Nevertheless, this variability is frequently noticed, not only in paralyses of the muscles of the eye, but also in typical bulbar paralysis, incidental to these and depending upon degenerative changes in the nuclear region of the central gray matter (polyencephalitis) of the medulla oblongata.

Bearing this in mind, as well as the fairly typical progression of the manifestations of disease shown by the following history, one might have expected to find an affection of the nuclei lying in the floor of the fourth ventricle, which, passing forwards, first attacked the abducens, and then implicating the hypoglossus, facialis, and vago-accessorius regions, finally resulted in total paralysis, owing to the spread of the disease to the lateral pyramids of the spinal cord. The autopsy demonstrated a glioma in the ventral surface of the pons, which had destroyed the tracts in the pyramids, but had not affected the nuclear region. The paralysis observed in the distribution of the cranial nerves—excepting that caused by direct disease of the abducens—was principally due to the pressure at their origin.

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[1] Die ursächlichen Momente der Augenmuskel-Lähmangen, 1885.

Catherine B., 20 years old, received at the clinic Nov. 14, 1885, says she has always been healthy. About six weeks ago was taken with vertigo and headache and noticed several days that she saw every thing double. Diplopia persisted about three weeks and then disappeared. In the meantime a convergent strabismus of the right eye developed. Headache better, but frequent attacks of vertigo, which were worse at night. Menstruation normal.

When received, patient's appearance was healthy ; nothing abnormal with heart or internal organs. Urine free from albumen and sugar. No syphilis. The right eye is deflected internally and shows defective motion outwards of 3 *mm* as compared with the left eye.

No diplopia observed spontaneously ; with red glasses the double images are homonymous and diverge when the eye is rotated outwards. Except the paresis of the right abducens there is nothing abnormal in either eye. Perfect vision and good accommodation on both sides, Right H 0.5, Left emmetropia. The facial muscles seem normal, except that the left naso-labial fold is somewhat smoother and the left corner of the mouth a little lower. On the other hand, the mouth can be completely closed, she can whistle, etc. At times, however, during the period of observation there were slight variations in this ; the right angle of mouth being sometimes lower, while with closed lips the corners of the mouth were not always equally sharp and pointed. A slight impediment is noticed in the speech, but patient claims this has always existed. No abnormality of tongue or palate. No other paralytic symptoms or disturbances of sensation are present. Patellar reflex somewhat increased. Reflex clonus of foot barely perceptible. Several days later, it was noticed that the paralysis of the right abducens is less, but paralysis of the same muscle now appears on the left side. Motion and size of pupil normal on both sides. At the same time the patient complains of a fresh attack of headache and vertigo.

There is some unsteadiness with closed eyes, but this disappeared several days after. Until Dec. 2d, the left abducens paralysis continued to develop gradually, with variations as on right, while the right side was, if any thing, somewhat better. Dec. 9th: Patient complains of a sound like boiling water in the left ear. *Mt* normal. After the tuning-fork is no longer heard on the vertex, it is still perceived before the ear. There is no remarkable decrease of hearing. Pain in head and vertigo have ceased. Dec. 17th: Vomiting this morning and pronounced vertigo even while recumbent. Speech is thicker as though the patient could not move the tongue well, but stretches it out as usual. Temperature 38.2°, pulse 100–112. Repeated vomiting the following day. Tottering gait, with a tendency to lurch to one side. Muscular strength as well as sensibility is undisturbed. Knee and foot reflexes are present. Fundus of eye normal. Sense of color and light also physiological (with Förster's photometer).

In the course of the month patient's general condition improved somewhat, but in January the disturbance of gait became more and more remarkable. She is now often peevish and complains of nausea and vomiting. Temperature not elevated, but pulse 120. Disturbance of speech is becoming more marked; she pronounces few words distinctly. Difficulty of deglutition and occaional regurgitation of the food through the nose. These latter symptoms vary, however, with any improvement in the general condition. Jan. 16th: No headache and while in bed no vertigo. Is very much prostrated and sits up with difficulty. Gait very tottering with dragging of feet. Roaring in the left ear occasionally. Left naso-labial fold contracts somewhat less than the right when laughing, and when whistling the mouth is drawn to the right. Cannot wrinkle the forehead, nor open the mouth wide. Tongue drawn somewhat to the right when protruded. Speech labored, slow, the sibilant sounds especially indistinct. Patient prefers to swallow solid food, as fluids regurgitate through the nose. Taste intact, smell somewhat deficient, but she is suffering from a cold. She hears well, and answers correctly, as far as one can understand her. The sensibility, active and passive motion, and bodily power are not diminished. The reflexes are increased, but vary; sometimes the thigh and leg are in clonic convulsion for a minute after tapping the patella. The foot clonus is likewise exaggerated. The muscles of the face and extremities still respond to both constant and induced currents. Swallowing may be caused by placing the electrodes of the galvanic current upon the nape of the neck and larynx, and is improved by every application. Organs of the breast and the heart are normal. Pulse 100–120. Temperature not elevated. Toward the end of January the condition was much worse. Gradual and extensive paresis and paralysis of the muscles of the back and extremities have appeared, so that the patient can no longer move herself. The sphincter muscles of bladder and rectum remained active to the end. There is more and more difficulty of swallowing and a sound must be used to nourish the patient. No change of the lingual muscles is apparent. Several days before death the mouth closed firmly, necessitating rectal alimentation. The speech varied in distinctness even to the last. On January 26th, when the patient's mother arrived, she seemed decidedly better.

Jan. 28th : Repeated vomiting was followed by a rise of temperature (38.7°–39°). Respiration 72, shallow; occasionally rattling in the trachea. Patient very pale and sometimes cyanotic. She can now neither speak, swallow, nor open the mouth, and the muscles of the trunk and extremities are completely paralyzed. Passive motion of legs is restrained, to a less degree in the arms. Knee reflexes are barely perceptible. Foot clonus not so marked as before. Movements of the eyelids and muscles of the eye, excepting the external recti, are normal. Pupils react to light and are regularly contracted and dilated. When spoken to, patient hears and understands, but responds only by a slight, almost imperceptible, shaking motion of the head. The facial muscles remain immovable and respond more strongly to the constant current than before. Swallowing is easily performed. As the patient was raised to examine the posterior parts of the lungs, breathing ceased suddenly and she was at once laid down and artificial respiration instituted.

The background of the eye had hitherto shown nothing abnormal, but Jan. 29th, a slight change was noticeable : the papilla of the optic nerve and the adjoining retina seemed slightly hazy. A distended vein is noticed in the right eye, coming from below and showing a distinct pulsation (even beyond the papilla) which was not noticed before. All these phenomena, however, exceeded the physiological limits to such a slight extent, that they could hardly be rated as pathological, except by comparison with the earlier appearances.

Jan. 30th : The respiration became irregular and occasionally interrupted. The patient lay perfectly immovable and stiff, but was conscious. Death followed at 5 o'clock in the morning of Jan. 31st.

Autopsy, noon, Feb. 1st, by Professor Marchand.

Body well formed and pretty well nourished. Right pupil very much contracted; left moderately dilated. The cranium is of ordinary thickness, transparent, with smooth inner surface. Symmetrical tension of the dura mater, not exceeding the normal; its vessels are pretty well filled, especially the veins. A soft clot of blood in the longitudinal sinus. Inner surface of dura mater smooth and shiny. Pia mater upon the surface of the brain is delicate throughout; its vessels moderately injected, the veins of the posterior region more noticeably congested; no œdema. Upon removal of the brain, the base shows an irregular swelling of the pons, embracing both halves, but more especially the right side. The swelling is due to a soft tumor-like mass growing forward from both sides, and showing a gutter or depression at its middle, in the depths of which lies the Art. basilaris, congested but somewhat contracted. The mass of the tumor is of a pale reddish color, and shows on the right near its centre, a darker, partly brown spot, 1 *cm* in diameter. The surface of the tumor is covered with numerous small congested vessels. Anteriorly the mass reaches to the crura cerebri, on both sides and seems to encroach upon them in part. The basis of both crura is likewise swollen, and this portion is divided from the part lying above it by a groove, in which the posterior cerebral artery is discovered. Both oculo-motorii are seen issuing from the swollen part of the crura, but their substance is unchanged. The left trigeminus lies pressed flat against the tumor and is reddish-gray while the left is more whitish and less compressed. Both trochlear nerves cross the tumor without change; both abducens nerves, however, are seriously implicated. The right nerve, at its origin, can only be recognized in places as a white streak, partly overgrown by the translucent pale gray masses. Farther forward, the nerve appears as a whitish band, flattened down upon the under surface of the tumor. The left abducens is much flattened in its first part and partly concealed by the hilly prominences of the mass; farther it appears more distinct, is paler and more translucent. At the under surface of the pons there is nothing left of normal substance. The greatest length of the tumor, left, is 4.5 *cm*, right, 4.5 *cm*, its greatest width 5.5 *cm*.

The shape of the tumor was probably determined by the contour of the skull. The facial and acoustic nerves are somewhat flattened, but white.

The upper part of the medulla oblongata is greatly misshapen, broad, short, with pyramids, and olives projecting but little from the general mass. The right tonsil of the cerebellum is pushed downwards and forwards into intimate contact with the medulla.

Section through the middle of the pons and crura cerebelli ad pontem shows the mass of the tumor of a pale reddish-gray color penetrating deeply into the substance, but not sharply defined from its surroundings. The parts lying towards the middle and base are especially homogeneous, transparent, and pretty solid. The right half of the pons is also, for the most part, involved in the same tumor, so that only a few traces of the pyramid bundles and the arched fibres of the posterior part of the anterior section stil remain. These latter fibres are somewhat more distinct on the left side. The mass then penetrates somewhat farther into the crura cerebelli. A series of punctate, congested vessels are seen, especially numerous on other parts of the section, but no distinct hemorrhages.

The posterior section of the pons is about 1 *cm* thick, and apparently unchanged, although its substance is somewhat soft. The cerebellar substance is unchanged. The lateral ventricles are somewhat enlarged. Frontal section of the brain shows no change. The cortex is about 3 *mm* thick and reddish-gray. Gray matter similar in coloration. White matter anæmic.

Macroscopically, the spinal cord, heart, and abdominal viscera offer no appreciable pathological changes. Some old as well as fresh lobular pneumonic foci show in the lower left lobe of the lung, but are more marked in the right lower lobe.

The eyes were laid free from above, a section was made in the plane of the equator, and the posterior halves of the bulbi were removed with the optic nerves attached to them. The retinæ seem somewhat opaque in the papillary region, and there is congestion of the retinal vessels. No distinct swelling of the papilla.

The brain-substance was immersed in Müller's fluid and alcohol, and a number of sections were made by Prof. Marchand through the focus of the disease, when more was seen touching the extent of the affection, even without the aid of the microscope. These appearances are essentially the following :

1. Section directly above the pons through the crura cerebri

and corpora quadrigemina. Both crura seem unchanged in their substance, except at the edges, where the tumor encroaches slightly but superficially.

2. Cross-section through the pons, about the middle of its height, passing through the crura cerebelli ad pontem, about 0.5 *cm* under the exit of the trigeminus. The section corresponds very nearly to the original made in the fresh state, but the surface had to be trimmed off a little in the interest of a smooth section.

The pons appears very much thickened. Diameter antero-posteriorly 3.5 *cm*. Width at the cerebellum 4.7. The principal point of thickening is at the anterior portion; the posterior, measuring about 1 *cm*, being without perceptible change. The microscope also corroborates this. The anterior section of the pons measures antero-posteriorly about 3.5 *cm*; this region is then subdivided into a posterior part about 1.2 *cm* thick, which shows no recognizable change (the transverse fibres of the pons are distinctly visible), and an anterior portion, which is infiltrated by the mass of the tumor.

The fasciculi of the pyramids are still distinctly limited, especially in the left half; on the right they disappear anteriorly and towards the middle into the infiltration. The mass of the tumor forms irregular, knobby prominences upon the surface. (Fig. 1.)

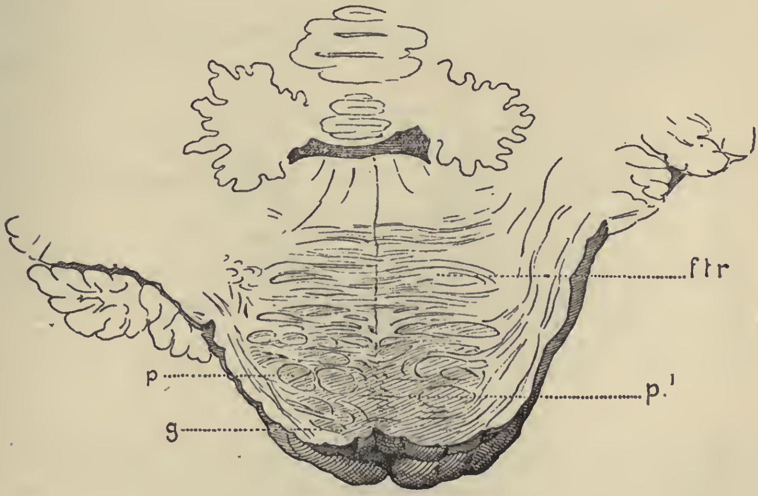

FIG. 1.

3. Transverse section about 1 *cm* under the foregoing, but somewhat more oblique, passing downwards and backwards. On the left the section passes through the origin of the facial and acoustic nerves ; on the right it goes through a little higher. The greatest width of the pons is 4 *cm*. The infiltration by the tumor takes in the whole anterior division of the pons, in the middle line, to a depth of 1.6 *cm*. In addition to this there appear near the middle, prominences ½ *cm* thick, before mentioned as enclosing the basilar artery. The fasciculi of the pyramids are swallowed up symmetrically and pretty completely on both sides ; here and there an occasional trace of lighter transverse fibres. The round bundles of the pyramids are thickened very much and barely indicated. The sides of the swelling posteriorly reach very near to the exit of the facialis. (Fig. 2.)

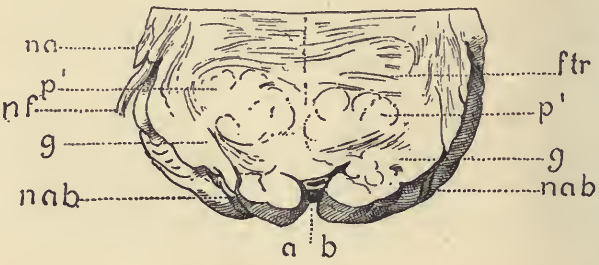

Fig. 2.

4. Section about 0.5 *cm* under the preceding and about as far above the lower edge of the pons. (Fig. 3). At the right it cuts right under the origin of the acoustic and facial. The posterior division of the pons appears normal for about 1 *cm;* the entire anterior division is extremely swollen; the section is 3.2 *cm* wide,

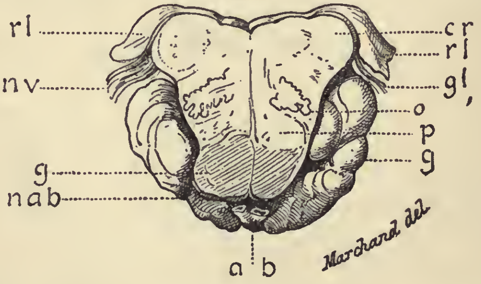

Fig. 3.

by 2–7 *cm* diameter in depth. The contour is broken up by tumor-like proliferations, which form a swelling more than ½ *cm* thick immediately before the origin of the acusticus. The facialis and acusticus, however, in their course, as well within as without the pons, seem unchanged. In the anterior division there are still a few arched fibres, to be seen indistinctly. The bundles of the pyramids are very indistinctly accentuated, and the surface of the section gliomatous throughout its extent. In the right half of the anterior division of the pons, in the immediate vicinity of the N. abbducens, at which point it is quite near the surface, is seen an extravasation of blood, of dark reddish-brown color, and 7–8 *mm* in diameter. On the right side the abducens is grown over by the knobby prominences upon the surface; its substance is not, however, infiltrated. On the left side it lies free.

5. Section at the beginning of the medulla close to the lower border of the pons. (Fig. 4.) The medulla is greatly enlarged, antero-posteriorly, 2.2 *cm*, in the middle. The greatest width posteriorly, in the region of the restiform bodies, is 2.5 *cm*, anteriorly, near the olives, 1.9 *cm*, and in the neighborhood of the pyramids 1.5 *cm*. The whole posterior section including the olives is without change, while the anterior portion is occupied by a mass —1.2 *cm* in thickness; this is not distinctly separated from the fasciculi of the pyramids, except on the left, where an arched boundary line is recognizable, about 8 *cm* behind the anterior contour.

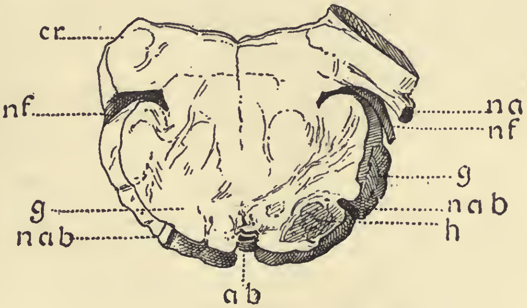

FIG. 4.

The abducens, at its beginning visible on the left side of the section, runs between the lateral knobby prominences, through which its fibres may be followed to a certain extent. At the right its origin is not so evident.

For the microscopical sections, parts were taken from the region of section 2 and lower down, also portions of the medulla, directly under section 5. These sections were treated partly by Weigert's Copper-Hæmatoxylin method and partly by picrocarmin; then imbedded in celloidin and carefully cut. Other smaller sections were prepared from the different parts of the seemingly normal substance, as well as from the diseased pons and medulla.

Microscopic sections through the whole medulla, close under the last described section, show, as a whole, similar appearances. The deep diameter is much greater, owing to the mass of the tumor hanging over the anterior border of the pyramids, but behind the tumor is distinctly separated from the pyramidal tracts by a thin layer of loose connective tissue, so that in the colloidin preparations the mass of the tumor may be easily detached from the pyramidal substance. The pyramids are somewhat flattened and slightly broader, but show no trace of the substance of the tumor. That portion of the tumor which projects over the pyramids anteriorly (from above, or rather from the lower border of the pons) has a thickness of 5–6 *mm.* The roots of the hypoglossus pass beneath this proliferation and make their exit laterally. The preparations, stained by Weigert's method, from the upper part of the pons, which include the greater portion of the entire anterior region, show the progressive infiltration of the nerve substance most distinctly. The fasciculi of the pyramids show themselves as round figures (corresponding to the macroscopic appearances), somewhat more distinctly on the left side, the boundary lines of which anteriorly gradually disappear in the homogeneous infiltration. The transverse fibres, also, are still recognizable, but are more and more indistinct anteriorly, and are wholly separated from each other by the substance of the tumor. At almost every point, however, they are still recognizable with the microscope as fine black lines, grouped in large bundles, which become more isolated as the anterior periphery is approached. In the cross-sections of the fasciculi of the pyramidal tracts, the nerve filaments are seen as small black points, so scanty, however, in the posterior fasciculi, that only a blackish coloration is evident to the naked eye. The preparation, for the most part, shows a yellowish-brown color.

The tumor is moderately vascular, and is composed of numerous small round cells crowded together so thickly that they can hardly be isolated. The parts of the posterior divisions of pons and medulla oblongata, which appear unchanged macroscopically, also present nothing abnormal under the microscope.

The spinal column was not sufficiently well preserved for delicate examination ; but there was no noticeable appearance of secondary degeneration in the pyramidal tracts. According to this, there existed a diffused gliomatous degeneration of the whole anterior section of the pons, advancing probably into the neighborhood of the fasciculi of the pyramids, or into the pyramidal tracts themselves. The mass of the tumor developed anteriorly as well as laterally far beyond the normal limits, and destroyed the pyramidal tracts in the pons, as far down as its lower border, while they escaped unmolested upon passing into the medulla. The fibres of the commissure in the anterior section of the pons were destroyed, while the greater part of the latter remains untouched. In fact the whole posterior sections of the pons and medulla, with their collections of gray matter, nerve nuclei, and outgoing nerve fibres, were not included in the ravages caused by the tumor ; the abducens nerve, alone, seems to be the only one to have been directly affected in its course through the medulla, as well as at its exit. The other nerves appear only to have suffered from the pressure of the tumor at their origin.

The disease began, as reported, with paralysis of the right abducens, subsequently followed by that of the left, while the right eye became somewhat more movable ;—the paralysis on the left side, however, varied in the same manner. Incidental to this, pain and vertigo. About two and a half months after the beginning of the affection, the disturbance of speech (caused by the hampered movements of the tongue) and slight paresis of the lower facial region became pronounced, and now the gait is somewhat unsteady. All these manifestations, however, were subject to variations, but as a whole they increased gradually ; the spastic gait became more pronounced, with increase of the patellar reflexes ; likewise, the disturbance of swallowing was more marked, accompanied by closure of the mouth. Finally, at the end of the fourth month, there existed complete paralysis of the muscles of the back, extremities, and face, except the orbicularis, and those muscles supplied by the motor oculi and trochlear nerves. This was accompanied by spastic stiffness of the muscles of the extremities. There was no wasting of the extremities or tongue, and they remained responsive to both the constant and induced currents. This course might, according to this, indicate disease of the nerve nuclei, with implication of the lateral pyramidal tracts. It was impossible to determine whether polioencephalitis was present (as would seem to be indicated by the somewhat rapid progress), for the same symptoms might be produced by the development of a tumor acting either directly or by pressure upon the nuclei, as has been recently demonstrated by one of Uhthoff's[1] cases, in which complete ophthalmoplegia externa was caused by a solitary tubercle, of the size of a hazel-nut, situated in the medulla oblongata. Still, it seemed remarkable, considering the long duration of the disease, that there was no choked disc, the absence of which seemed to militate against the existence of a brain tumor. We know, to be sure, that disease of the optic nerve may also be wanting in tumor of the brain, but this is rare where the neoplasm is large and of rapid development.

Finally, a few days before the end, the ophthalmoscope showed traces of a beginning intraocular optic neuritis. In both eyes, the papilla and retina below the entrance of the optic nerve were somewhat hazy, and a congested pulsating vein was noticed in the right eye extending beyond the papilla, and in fact the microscope showed these appearances to be the beginning of choked disc.

The posterior halves of the eyes were hardened in Müller's fluid and alcohol. The optic nerves attached to these halves showed a moderate distention and looseness of the sheath, which was slightly movable in the neighborhood of the globe. The preparations were first imbedded in paraffine and longitudinal sections were then made transversely through the papilla optica and the adjoining part of the optic nerve, while nearer to the brain cross-sections were made, together with teased preparations. These were stained with carmine, borax-carmine, hæmatoxyline, chloride of gold, and analine dyes. It was noticed, especially in cross sections, that the interstices between the bundles of nerve fibres and the connective-tissue reticulum seemed larger than they are usually seen ; these latter were partly empty, and partly filled with a transparent mass, broken up into figures of manifold shapes. Sometimes isolated swollen fibres of connective tissue were seen passing over from the principal stroma, through the interspaces into the nerve bundles. The connective tissue stroma surrounding the vessels was, for the most part, separated from the neighboring nerve bundles and partly frayed out. The peripheral parts of the optic nerve showed fewer interspaces, but the pial sheath was detached from the nerve bundles in several places. These changes could be followed as far back as the entrance of the vessels into the optic nerve ; they were however rarer and less marked in the tract between the cerebrally situated entrance of the artery and the more peripheral location of the vein. Still nearer to the optic foramen, they were so rare that they could not be distinguished from the ordinary spaces which appear in such sections. The calibre of the art. centralis was unchanged and fairly round, while that of the vein was slit-shaped. Between the external fibrous sheath of the optic nerve (upon which the dural sheath, separated for the most part from the arachnoidal sheath, was easily distinguished) and the pial sheath, especially near the globe, there existed a wide space, traversed by the connecting bands, some of which were covered with small round cells. The endothelium of both sheaths was quite distinct ; there was no proliferation of the nuclei. Even in the optic nerve itself, there were no traces of pathological increase of the cells. The section through the papilla showed the network of the lamina cribrosa, which passed straight across the nerve, without the pronounced concavity seen normally. In the papilla itself were seen transparent interspaces between the separated nerve fibres, giving the peculiar sponge-like appearance described in detail by Rosenbach.[1] No proliferation of nuclei, aggregations of cells, or hemorrhages are to be seen here ; likewise, there is no considerable vascular development. Several of the largest veins are congested with blood, but in other preparations they are quite empty. Many of the nerve fibres showed the well known ganglionic thickening ; these were even seen isolated in the lamina cribrosa. They were likewise seen in different parts of the adjoining nerve substance of the retina, but were isolated, not arranged in nests, and of very varying size. This change probably accounts for the haziness noticed with the opthalmoscope. Great congestion of the retinal vessels is also seen ; several isolated capillaries, running traversely through the fibrous layer, almost perpendicular to the ganglionic layer, are especially remarkable.

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[1] Tageblatt der 59. Versammlung deutscher Naturforscher und Aerzte, 1886, S. 156.

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[1] *v. Gräfe's Arch.*, Bd. xv., Abth. 1.

There were no other changes of the retina. The papilla can hardly be regarded as especially swollen ; the thickness of the layer of nerve fibres at the hole in the choroid is 0.41 *mm.* The central excavation, at the point of exit of the blood-vessels, is well preserved.

According to this examination, besides the moderate enlargement of the subvaginal space, the principal pathological changes are œdema of the ocular end of the optic nerve and of the papilla, and the ganglionic change of the optic-nerve fibres. Hyperæmia and stasis were less pronounced. This about corresponds with the appearances described by Ulrich[1] last year, but in my case the venous stasis is not so pronounced, partly because my examinations were made at an earlier period and partly because of the non-extension of the œdema to the more central parts of the optic-nerve stem. The ganglionic change of the nerve fibres is due to the swelling of the axis-cylinder in the increased lymph fluid (Rumpf, Kuhnt), and it seems to me that this case, dissected at an unusually early period, since no inflammatory symptoms were present, may be advanced in support of my so-called "Transport-Theorie," according to which the subdural or subarachnoidal fluid is forced out of the skull into the subvaginal[2] space, which it distends, and leads to œdema of the lamina cribrosa. This latter condition first causes venous stasis by pressure on the vessels, and later on may give rise to inflammatory processes, due to the damming up of the arterial supply of the blood. This view has received substantial support from the experiments of Manz, and more recently from those of Schultén, together with clinical and pathologic-anatomical observations. Leber, and also Deutschmann in his last exhaustive work,[1] have modified this somewhat by supposing all cases of "choked disc" to be of an inflammatory nature. According to the above authors, germs pass into the sheath of the optic nerve from the cavity of the cranium, which excite inflammation and cause papillitis. It may, however, here be objected that although older cases of "choked disc" of longer duration, such, for instance, as those communicated by Deutschmann, may be here included,—may be without doubt referred to inflammatory processes, the symptoms of œdema and hyperæmia undoubtedly predominate in the beginning. To be sure these are more often verified by the ophthalmoscope than by the autopsy. I have often had occasion to observe the commencement of "choked disc." At first a slight haziness of the tissue and venous stasis is observed, and later on pronounced swelling, which is often recognized to be essentially œdematous, owing to its remarkable transparency. The unilateral pulsation of a dilated vein, which was especially interesting in the present case, was verified before death, and is easily explained by the interference with circulation in the œdematous connective tissue of the lamina cribrosa and adjoining optic nerve. Other observers have also described similar appearances in the first stage of "engorged papilla." Knapp,[2] for instance, found the papilla and surrounding region "hyperæmic and œdematous"; Ulrich,[3] "papilla slightly reddened, borders somewhat hazy, more marked left, still possibly physiological on both sides; the veins seem greatly congested." It would be easy to add to these examples. Of course it is seldom that we have an opportunity of making an anatomical examination at such an early stage, when inflammatory phenomena are not yet present. Such cases exist, however, and Deutschmann himself cites those of Iwanoff, Herzog, Pagenstecher, Rosenbach, Treitel, and Ulrich. He utilizes these cases in order to emphasize and render prominent alterations which seem to him to be due to inflammatory changes: collections of lymph corpuscles, for instance, which might quite as well be due to venous stasis; or the sclerotic thickening of the nerve fibre, which, as above mentioned, may be referred to the action of the œdema. Deutschmann also does not believe that Ulrich's results, showing wide interspaces between the nerve bundles and the connective-tissue reticulum, prove the existence of preceding œdema, but thinks that these appearances may be caused by the treatment with celloidine. This is true to a certain extent, and will always antagonize the microscopic diagnosis of œdema. Comparison with normal sections treated in the same manner would probably decide the matter in favor of Ulrich. Teased sections in Rosenberg's case of "choked disc" likewise showed œdema of the papilla; a fine grayish homogeneous substance similar to coagulated lymph was found in the network. Rosenberg's statement that the ocular part of the optic nerve in fresh condition was found to be "softened," without noticeable micropic deviation from the normal, is especially interesting, as perhaps there was a partial development of myeline granules in the nerve fibres.

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[1] *Arch. f. Augenheilk.*, Bd. xxvi.

[2] Even if, in opposition to Quincke, we accept the theory of a lymph current running from the subvaginal space *to* the brain, the increase of intracranial pressure would cause stasis within the sheath.

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[1] Ueber Neuritis Optica, besonders die sog. Strauungspapille und deren Zusammenhang mit Gehirn-Affectionen, 1887.

[2] Tageblatt der Strassburger Naturforscher Versammlung, 1885.

[3] Ueber Stauungspapille und Oedem des Schnervenstammes.—*Arch. f. Augenheilk.*, Bd. xvii., S. 34.

The real commencement, therefore, of choked disc is to be regarded as an œdematous infiltration of the ocular part of the optic nerve, and not as an inflammatory process. If, as Deutschmann maintains, choked disc "is due to the influence of inflammatory germs passing out of the cavum cranii into the sheath of the nerve, with the cerebro-spinal fluid," why do not the other nerves and parts of the brain which are permanently immersed in this infecting fluid, show inflammatory changes? The appearance of inflammation after the choked disc has existed for some time is explained by changes in the arterial blood supply, or it may be that the œdema and interference with the nutrition of the surrounding tissues prepare a favorable breeding-ground for any germs which may happen to lodge there. Deutschmann injected the subdural space with a solution of agar-agar, and in spite of permanent distention of the sheath of the optic nerve with the fluid, he found no symptoms of choked disc, with the exception of changes in the vessels. I think this was due to the fluid used, which coagulates very quickly and is not likely to find its way through the fine spaces of the pial sheath of the optic nerve and the lamina cribrosa.

The theory of œdema of the lamina, however, is especially dependent upon this communication between the subvaginal space and the lymph spaces of the lamina cribrosa. Schwalbe thinks that my successful injection of the lamina cribrosa from the subdural space of the cavity of the cranium, was due to the fact that, in some cases, the resistance to the penetration of the fluid into the pial sheath is not so great as in others. This may be so, but, at any rate, these communications exist, as is shown by injections under the pial sheath in the neighborhood of the lamina cribrosa: the whole transverse section of the latter is seen to be filled; the mass is also seen passing out through the pial sheath into the subarachnoidal space of the sheath of the optic nerve (Schwalbe, Wolfring). In fact, Deutschmann *did* produce a real, non-inflammatory choked disc, by injection of the subvaginal space of the rabbit, although this was attained by a greater over-filling of the space than has ever been observed in man. I think, however, that such excessive conditions are not at all necessary to produce the same effect. A moderate but slow increase of the fluid in the subvaginal space, which is more prone to accumulate at the ocular end (as our pathologico-anatomical observations have shown us), owing to the frequent changes of pressure in the subvaginal space caused by the movements of the eye, would certainly be followed by oozing and penetration into the lymph space of the lamina cribrosa, through the existing openings. It may be quite appropriately mentioned here that the downward convergence caused a searing or dragging of the scleral insertion of the optic nerve [whether by direct action of the superior oblique (Stilling), or by the contraction of the internal rectus], which is transmitted to the accumulation in the subvaginal space, and the pressure upon the fluid in the tense sheath is increased. This higher pressure is not compensated for at once, because the interstitial tissue of the intervaginal space offers an obstacle to the recession of the lymph to another part of the sheath of the optic nerve. Movements of the eye must therefore facilitate the passage into the lamina, even without permanent and absolute tension of the sheath. Hence it does not seem remarkable that in choked disc due to encroachments upon the intercranial space, an *excessive quantity* of fluid (a so-called hydrops vaginæ nerv. optici) in the subvaginal space should be wanting. However, the post-mortem appearances by no means determine the condition during life. It should also be remembered that, in addition to the possibility of the post-mortem escape of the lymph when the optic nerves are severed, the œdematous infiltration, which was distinctly seen to be present in life, may disappear after the death of the patient. There is even very little left of the normal cerebro-spinal fluid. Especial weight should be laid upon the degree of looseness or movability of the external fibrous (dural-arachnoidal) sheath upon the inner one, as it is of great importance to the diagnosis of an *intra-vitam* increase of the subvaginal fluid, since it denotes an enlargement of the intervening space between the external and internal sheath. I have verified this remarkable movability in all autopsies of brain tumors accompanied by choked disc at which I have assisted, although it is impossible, in certain cases of moderate looseness of the sheath, to definitely draw the line between the physiological and the pathological condition, just as is true of moderate accumulations of fluid in the sheath. With regard to this, however, I discovered a similar appearance in only one of twenty-two eyes belonging to individuals of different ages, which had been hardened in Müller's fluid, and which were *not* affected with choked disc, while I have always found this change, but more marked, as a rule, in all eyes that *were* so affected. In addition to this the optic nerves in question were cut off quite short and torn in a longitudinal direction.

Cases of excessive atrophy of the optic nerve and extreme myopia, in which the sheath is also loose and the subvaginal space enlarged of course, are not considered in this connection.

I cannot, therefore, accept the absence of pronounced hydrops intervaginalis at the autopsies of different cases of choked disc, as a convincing objection to the correctness of the transport-theory. Ulrich, however, in his last paper, returns to Parinaud's view of the passage of the œdema directly from the brain through the trunk of the optic nerve. I think he is wrong. In the first place, there is often no œdema of the brain at all, as, for instance, in the case cited in the preceding pages. More than this, and this seems to me not less important, there is no trace of œdematous infiltration in the majority of cases in those parts of the optic nerve farthest removed from the eye; moreover, the late secondary changes have their principal site in the papilla, and gradually disappear towards the brain. Ulrich himself reports a quantitative decrease of the œdema as the optic foramen was approached. In my case, this was not verified beyond the entrance of the vessels. Also in another case of advanced choked disc, which was examined after Ulrich's paper was published, I could find nothing of the kind.. This agrees with the results obtained by most other authors. I believe, consequently, that this proves sufficiently well that the bulbar part of the optic nerve is the point of outflow of the œdematous infiltration. In our patient, the beginning of the choked disc was relatively late; without doubt due to the very gradual development of the intracranial pressure. This is corroborated by the clinical absence of intense symptoms of pressure. Perhaps the site of the tumor at the foramen magnum also hindered the free communication with the spinal fluid, and thus limited the supply from this source. (Quincke's experiments show that this supply is physiological.) There was undoubtedly excessive narrowing at this point, as is shown by the pressure upon the hypoglossus and vago-accessorius, thereby causing the bulbar paralysis.

As shown by section and further observations of my colleague, Dr. Marchand, the nuclear region in the floor of the fourth ventricle and the central nerve fibres were not attacked by the tumor, and the abducens nerves were only directly affected at their exit from the brain; the most damage was done to the pyramidal tracts. The paralytic symptoms were very variable (as is, however, often seen in tumor of the brain), although the disease was non-nuclear.

Nuclear paralyses have been regarded with great interest recently, and I have no doubt that many cases of ophthalmoplegia, which have been mistaken for this condition, have afterwards proved to be only pseudo-nuclear paralyses. Even the uncomplicated exterior ophthalmoplegia where the fibres of the motor oculi supplying the muscles of accommodation and the iris retain their function (which is regarded by Mauthner as a certain evidence of the implication of the nuclear region), according to Moebius,[1] may be of peripheral origin.

In conclusion, I would like to call attention to the change in the pupils which I have often noticed on the cadaver, and which was also present in this case. Although both pupils were symmetrically contracted just before death, at the autopsy (thirty hours after death) the left one was moderately dilated, while the right was remarkably contracted. After the right eye had been halved for the purpose of securing the preparation, myosis made its appearance. Marshall,[2] to whom we are indebted for a detailed investigation of this point, also noticed that the post-mortem contraction of the right eye is often more marked than that of the left. He was not able to assign a cause for this. Closing the eyes did not change the result.

Explanation of the Cuts.

See text for the different sections. *g* = gliomatous mass ; *p* = pyramidal tract ; p^1 = infiltrated pyramid bundles ; *ftr* = transverse fibres of the pons ; *o* = olives ; *cr* = corpus restiform ; *na* = n. acusticus ; *nf* = nerv. facialis ; *nab* = n. abducens ; *nv* = nerv. vagus ; *ng* = n. glossopharyngeus ; *ab* = art. basilaris.

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[1] *Centralbl. f. Nervenheilk.*, 1886, No. 27.

[2] *The Lancet*, 1885, S. 286.

TOTAL CONGENITAL STAPHYLOMA OF THE CORNEA WITH DERMOID FORMATION.

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(*With one plate, Tab. iii., of vol. xviii., Germ. ed.*)

Translated by John E. Weeks, M.D., New York.

IN August, 1885, Christina S., of Vierfeld, aged six months, was brought to the clinic on account of a congenital malformation of the eye. The left eye was normally developed in all its parts. The lids of the right eye were separated by the protrusion of two tumors, each about the size of half a cherry. By a more complete separation of the lids the cornea appears to be almost entirely covered by the two tumors; (Tab. III. fig. 1.) however, above and below, between their bases, a triangular space, measuring 2–2½ *mm* at the base, remains free. The bases of the tumors are not united; between them appears a narrow band of clear corneal tissue, which unites the apices of the two triangles. The tumor at the inner side is about two thirds larger than the outer one, and consequently projects further forwards. Towards the sclerotic the tumors become flattened out and pass imperceptibly into that membrane, while on the cornea their walls are relatively abrupt. The tumors do not appear to lie on the cornea, but to pass into corneal and scleral tissue. In color and general appearance they resemble the integument; close inspection with a lens shows marked unevenness of the surface; the tension of the eyes is nearly alike.

At the root of the right ala of the nose is another tumor, which is somewhat larger than a pea, and is soft in consistence. Examined under an anæsthetic, the tumor is found to be a valve-like covering to the opening of a very small canal through which a very fine sound can be passed. The sound passes obliquely upwards and inwards for about two inches, causing the child to move as though it would sneeze. A sound passed through the right external meatus of the nose comes in contact with the first sound, indicating that the small canal opens into the nasal cavity. The sounds cannot be felt by passing the finger into the mouth.

It was agreed to enucleate the eye in the fall.

The child was next seen on February 2, 1886, at which time the tumors were found to have increased in size ; they lie against each other, seeming to pass one into the other There is but very little clear cornea to be seen. The surface of the tumors is reddened, the conjunctiva produces a copious secretion, and the border of the under lid is excoriated by the overflow of tears.

The palpebral fissure was enlarged to permit the passage of the globe, and the eye was enucleated. The tumor on the ala of the nose was excised at the same time.

Healing normal.

After hardening in Müller's fluid for a few weeks, a horizontal section of the globe was made, one half was washed in water, the hardening completed in alcohol, embedded in celloidin and sections were made with the microtome.

In the longest diameter the globe measured 26 *mm ;* width, 20 *mm.*

Macroscopically, it is evident that the tumors described *intra vitam* could not be regarded as such, but were simply staphylomatous protrusions of a thickened cornea with total adhesion of the iris. The lens occupies its normal position, and the vitreous is uncharged. Microscopical examination of the sections shows, at first glance, that, instead of cornea, the anterior portion of the globe is composed of integument. (See fig. 2, and its explanation at the end of this paper.) From the periphery towards the centre the epithelium gradually increases to two or three times the normal thickness, forming papilliform projections in places.

The outer layers resemble the horny layers of the epidermis. In some parts numerous epithelial processes project into the subepithelial tissue. These processes alternate with hair bulbs, part of which are perfectly and part imperfectly developed; from these bulbs well-formed or rudimentary hairs project above the level of the epithelium. In some places a hair bulb, with its accompanying well-developed sebaceous glands is encountered. Closely packed bundles of connective tissue, having a course nearly parallel to the cut surface, pass between the epithelial processes and the hair bulbs. Large and small round cells are found in the connective tissue, either heaped together or formed in long rows which frequently divide. Capillaries cut transversely or longitudinally are met with in many places. In every section a place is seen, near the anterior pole of the globe, small in some, larger in others, which is recognized as corneal tissue, and in which some scattered round cells are found. The connective tissue passes imperceptibly into corneal tissue on both sides. The place in which this corneal tissue appears indicates the location of the division line between the two tumors previously mentioned. The epithelial layer over this part is not so thick; no hairs are present, and there is but little evidence of the formation of papillæ.

From the centre of the pseudo-cornea towards the periphery the connective tissue loses its density. The bundles become separated and form larger and larger spaces, which are filled with adipose tissue—analogous to the integument. At the centre there is no adipose tissue, but in places the connective tissue is not very dense. This is particularly the case in the inner layers of the pseudo-cornea; here the tissue is very loose, and is rich in round cells, which are collected in large clusters. This tissue, which in general resembles the integument, is on its inner surface covered by a thin pigment layer, which extends from the ciliary body on one, to the ciliary body on opposite, side. This is the pigment layer of the iris, which covers the entire posterior surface of the pseudo-cornea, and is united with it in the greater part of its extent. Not much is to be seen of iris stroma, but between pseudo-cornea and pigment layer there exists a very thin membrane which is unmistakable iris tissue. This tissue is more characteristic and wider in the places where the iris is not adherent to the pseudo-cornea (see plate). The pigment layer is continuous over the rather prominent ciliary muscle and the normally developed ciliary processes. Over nearly the whole extent of the pseudo-cornea, lying between it and the iris tissue, united to the latter in many places, Descemet's membrane is seen. It is present throughout, and in certain places shows a layer of well-formed nucleated cells; this is particularly the case in a part near the anterior pole of the eye when the iris tissue is separated from the cornea. At this place sections of a number of nearly concentric layers of Descemet's membrane are seen (appears to be rolled up); some are cut obliquely, showing the flat surface of this membrane. The hyaline layer corresponding to this place has disappeared from the pseudo-cornea, but is seen again a little before the second space between cornea and iris tissue is reached, and from this point can be followed to the periphery. Schlemm's canal, the ciliary muscle, ciliary processes, and the zonular fibres, which are in part isolated, are well developed. The lens shows nothing abnormal and is in its normal position.

By microscopical examination of the posterior portion of the eye the vitreous appears to be normal; the sclera is of normal thickness. The choroid and retina are normal in all of their parts. The layer of rods and cones is particularly well preserved.

While the sheaths and subvaginal space of the optic nerve show nothing abnormal, the nerve itself is markedly atrophic. This condition is brought out very distinctly by Weigert's method of staining. Even by the hæmatoxyline stain, the bundles of nerve fibres appear smaller and are traversed by connective-tissue fibres. This is most marked at the centre of the nerve. At the periphery the nerve bundles and fibres are relatively well preserved. By Weigert's method there is no staining of medullary substance towards and at the centre of the nerve, and at the periphery there are only small bundles of faintly stained medullary nerve fibres. The papilla is not excavated. By the usual methods of staining the nerve-fibre layer of the retina does not appear to be changed.

The change in the posterior portion of the eye is confined to a partial atrophy of the optic nerve.

The above-mentioned tumor at the root of the right ala of the nose, was cut into sections. The principal part of the tumor is composed of loose connective and adipose tissue. From the centre toward the periphery the fatty tissue diminishes and the connective tissue increases in amount; round cells are scattered throughout. The outer surface is covered with integument, the under surface with mucous membrane. The transition from integument to mucous membrane is imperceptible. Towards the mucous surface we find three (two large and one small) groups of gland tissue which are macroscopically visible. The glands are of acinous formation, the acini being arranged close to each other, and are of the type of the salivary glands. In many of the microscopical specimens transverse and longitudinal sections of the ducts are visible, in the lumen of which, occurring at intervals, white mucous drops and œdematous epithelial cells are seen, much as they appear in the cysts of mucous glands.

But to return to our eye. The dermoid character of the tumors is established by the microscopical examination. Dermoid formations are not infrequently met with in malformations of the eye. Nevertheless, it has appeared best to report this case, for the purpose of enriching our literature on the subject; not so much in regard to the histological formation, the anomalies in which are seldom greater in any single case, as on account of the accessory condition, the topography of the sections, and the somewhat complicated etiology of the case.

The microscopical examination of dermoid tumors of the eye, described by v. Gräfe,[1] Ryba,[2] Virchow,[3] Heyfelder,[4] de Wecker,[1] Linati, C. and Visconti Achille,[2] Strawbridge,[3] Hirschberg,[4] Fuchs,[5] Van Duyse,[6] Vassan,[7] and F. Labouret,[8] relate only to circumscribed larger or smaller tumors, which, singly or in twos or threes, were situated on the cornea, the sclerotic, or on both. The growths never extended over the whole anterior portion of the uveal tracts ; in many cases after an operative procedure (levelling off with subsequent formation of artificial pupil) a more or less useful eye remained.

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[1] v. Gräfe, *Archiv f. pathol. Anatomie u. Physiologie*, Bd. vi., 1854. *Archiv f. Ophthal.*, Bd. i., Abth. 2, 1855.

[2] Ryba, *Prager Vierteljahresschrift.*, Bd. iii., 1853.

[3] Virchow, *Archiv f. pathol. Anatomie*, Bd. vi., 1854.

[4] Heyfelder, *Deutsche Klinic*, No. 28, 1858.

It was much different in our case. It could be determined macroscopically that the dermoid tumors did not rest on the cornea and sclerotic, but passed into—included these tissues. The opinion was substantiated by the microscopical examination. Of true corneal tissue but very little was to be seen in any of the sections ; it had given place to connective and adipose tissue and to the other parts of true skin. Only Descemet's membrane was present throughout the whole extent of the pseudo-cornea, but it was not intact. The iris, which in none of the reported cases was greatly changed, is rudimentary here, and throughout the whole of its extent is more or less firmly adherent to Descemet's membrane and the subjacent tissue. As above remarked, all sections show that Descemet's membrane is wanting in one place ; at this place the borders of the membrane appear to be rolled up. From the existing condition it is safe to assume that the embryonic cornea perforated and that total staphyloma of the cornea followed.

Regarding the production of dermoid tumors in general and the dermoid formations on the eye (see de Wecker, Ryba, Kraske, Michel, and others), Van Duyse, in opposition to the above authorities, has propounded an hypothesis by which he endeavors to show that these malformations, together with congenital tumors of the throat, coloboma of the eyelids, etc., are only the remains of early adhesions (synechiæ) between the inner layer of the amnion and the surface of the embryo. How and why such synechiæ should form is an open question, and will probably remain so ; but this does not make the hypothesis less tenable.

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[1] de Wecker, *Traité compl. d'Ophthal.*, vol. i., No. 1, 1878.
[2] Linati, Carlo e Visconti Achille, *Ann. d'Oculist.*, Bd. lvii.
[3] Strawbridge, *Amer. Jour. of Med.*, January, 1872.
[4] Hirschberg, *Archiv f. Augen- u. Ohrenheilk.*, Bd. iv., 1, 1874.
[5] Fuchs, *Zehender's klin. Monatsbl.*, No. 18, 1880.
[6] Van Duyse, *Annales de la Soc. de Méd. de Gand*, 1882.
[7] Labouret, *Thèse de Paris*, No. 203, 1885.
[8] Vassan, *Arch. d'Ophth.*, vol. iii., No. 1, 1880.

Apparently such synechiæ could only originate during that period of embryonic life before the amniotic fluid has begun to form, that is, during the first two or three months, —before the eyelids are fully developed. In the third month the palpebral fissure is still so wide that the cornea is almost entirely exposed ; it closes during the fourth month. The lids therefore do not prevent early adhesion between cornea and amnion. By the accumulation of amniotic fluid the synechiæ may be broken at any time before the development of the lids has advanced far enough to cause closure of the palpebral fissure (three months); the fragment of amnion remaining attached to the point of union on the globe develops into an epibulbar dermoid tumor. Coloboma of the lid, which frequently accompanies dermoid formations on the globe, may be accounted for by supposing a later separation of the band of adhesion. This theory, however, is not sufficient to completely explain the etiology of the above case. A review of the literature on dermoid formations teaches that these tumors rest on the cornea or sclerotic, as the case may be, and that they may be removed without destroying the cornea and iris.

It is a question whether the above-described condition can be explained by the dermoid formation alone. The rupture in Descemet's membrane and the complete adhesion of the iris would suggest an intra-uterine perforation of the cornea. The rupture and rolling in Descemet's membrane alone would not necessarily bear out this view, since cases of rupture of Descemet's membrane without perforation of the cornea are known, as resulting from pronounced ciliary and intercalar staphyloma (O. Becker [1]), and accompaning great stretching of the cornea in rapidly developing glioma (da Gama Pinto).[1] It is possible that in this case the staphylomatous bulging of the anterior part of the globe was the result of the rupture of Descemet's membrane simply; however, it is difficult to explain the condition of the iris without supposing a perforation of the cornea to have taken place. It is well known that, in the embryo, the iris is close to the cornea, and that an inflammation of the latter could easily be communicated to the former and lead to extensive adhesions between the two. It may be supposed that traction from two synechias by the rapid formation of amniotic fluid has produced a secondary inflammation at the place of attachment of the finally broken bands, and has weakened the newly formed cornea. There is nothing to combat the opinion that the inflammation extended to the iris, which on account of its proximity to the inflamed cornea became extensively adherent to it. The bulging of the changed and weakened cornea is accompanied with the iris tissue, partly agglutinated, partly thinned, while the structureless, less elastic Descemet's membrane has ruptured.

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[1] O. Becker, Atlas der pathol. Topographie des Auges. Zweite Lieferung, Taf. xviii.

In this manner the assumption of a perforation could be avoided, which would be the more desirable, as it has already been stated, that the rupture of Descemet's membrane occurred at the point where corneal tissue can yet be made out. If the place of the rupture were found in some part of the dermoid tissue, it would seem more plausible to assume a perforation. It might then be supposed that at the point where the largest synechia was formed, through increased traction the cornea became very weak and thin and so led to a rupture or perforation.

Although the former explanation of the cause of the condition is the more plausible, we may briefly allude to another.

It is a well known fact that in enbryonic life pathological changes take place, the etiology of which cannot be determined; at least the observations of congenital cicatrices of the cornea, partial and total staphyloma, and similar conditions indicate this. Although the etiology of this case is not simplified by the introduction of another factor, it should be kept in mind that the formation of synechiæ may have been preceded by a severe enbryonic keratitis, which has led to perforation of the cornea with extensive changes and adhesions in the iris. Synechiæ may readily form between the amnion and the inflamed and ulcerated cornea, after which the dermoid tumor may be developed. The appearance of the total staphyloma may be explained by supposing the occurrence of such a severe keratitis with ulceration and perforation, and it is plausible in this case to believe that the amnion synechia was formed immediately after the cornea had become ulcerated. It is not to be denied that it is difficult to understand when and how such synechiæ are produced ; but if the cornea is diseased and the epithelium is denuded in places, it is then possible that the surrounding membrane of the embryo may grow to the ulcerated surface, and the dermoid growth result.

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[1] Da Gama Pinto, Intravoculare Tumoren, S. 75, Bergmann, 1886.

In conclusion, the question naturally arises as to whether or not all dermoid formations of the eye are the result of pathological changes in the young cornea. It must, of course, first be established that in the early months of embryonic life, before the amniotic fluid has formed, inflamations of the cornea may exist. Then and only then can the cause of dermoid formations be safely referred to the formation of synechiæ.

The hypothesis of the formation of synechiæ is not confined to dermoid formations of the eye. Van Duyse is of the opinion that dermoid formation on other organs are due to the same cause.

Whether in these cases a pathological change at the point affected is to be considered as the first step, is a question that is difficult to answer.

A short reference to the small tumor at the root of the right ala of the nose will suffice.

As above mentioned, the tumor, which was about as large as a pea, was composed of connective and adipose tissue, covered with integument and mucous membrane. It contained a relatively large, three-lobed, acinous mucous gland, which formed a valvular covering to a small canal communicating with the nasal cavity. The condition is very probably one of congenital protrusion of the nasal mucous membrane, which had developed into a small adenoma containing mucous glands.

Explanation of the Figures.

FIG. 1. Sketch of the right eye and the tumor at the root of the right ala of the nose.

FIG. 2. Anterior section of globe. (On account of a want of space a portion of the lens, sclerotic, and ciliary body of the same side was omitted.) The section is made in the horizontal meridian, where the two tumors pass into each other.

E. = Epithelial layer. *H.* = Hair. *Ht.* = Hair with sebaceous glands. *P.* = Papillæ. *Cg.* = Corneal tissue. *Rh.* = Collections of round cells. *Rz.* = Chains of round cells. *Fg.* = Adipose tissue. *Bz.* = Strings or bundles of connective tissue. *K.* = Transverse section of blood-vessel. *O.* = Descemet's membrane. *eD.* = Descemet's membrane rolled in itself. *D.* = Rupture of Descemet's membrane. *Ist.* = Iris stroma rarefied. *Pb.* = Pigment layer of the iris. *Sch. R.* = Schlemm's canal. *S.* = Sclera. *Cf.* = Ciliary processes. *Cm.* = Ciliary muscle. *Zf.* = Zonula fibres. *L.* = Lens.

A CASE OF GLAUCOMA IN A CHILD.

By Dr. C. H. VILAS, of Chicago.

I TRUST the case of glaucoma I shall herewith submit in detail to the profession may not prove uninteresting, mainly on account of the time of life at which it occurred. I believe it to be unique.

August 4, 1888, Mrs. S., of Massachusetts, brought to my office her child, a bright and frolicsome boy. From her I elicited the following history of the case, which I relate in substantially her own words : " I am an American by birth, and so is my husband. I have never heard of any blindness or eye disease in either my own or my husband's family. My son was born on the 12th day of January, 1883, and, so far as I know, was in every way healthy, being so pronounced by the attending physician. I am certain he showed no defect in his eyes, because he was my first child, and I having had the sole care of him naturally frequently examined his eyes, as mothers do. Aside from the whooping-cough at three months of age, there was never any thing the matter with him until June, 1886, when I called the attention of my physician to an irritation of the child's lids. The physician made a prescription of some kind, but I did not use it, and do not think that difficulty had any thing to do with his present trouble. About a year later, in June or July, 1887, I noticed the pupil of his left eye was enlarged, as you see it in this photograph, which was taken in December following, and it has never resumed its former size. You can see by these other photographs I show you, taken at respectively six, eighteen, and thirty months of age, that there was no trouble with the pupil then. Nothing farther was noticed, and although I intended to take him to an oculist, I dreaded so to do it, I did not. About the middle of last March he went to bed one night as well as ever, but awakened in the night feverish and complaining of headache. I bathed his head and soothed him, but he was restless, afterward vomiting and complaining of headache and pain in the left eye and over the brow. His eyes were inflamed, and he complained of the light, and wanted it moved. I called it a bilious attack. He lay quiet —almost stupid—the whole of the next day, so unlike him; would n't open his eyes, grew more feverish and wanted all the light shut out. A physician was then called. This attack lasted two days, when he opened his eyes some, but they were badly inflamed, and the physician advised seeing an oculist. Then there was an interval of about a month, when he had another similar attack, though not so severe, the symptoms being limited to the head. He now seemed well, and I thought, as I was advised, that it was all over, though his sight did not seem bright. But about July 4th he had another attack, similar to the first, not so severe, but very persistent. He did not recover so completely as before. I was thoroughly alarmed now, and sought among my acquaintances where to take him for further counsel, the result being that I am here."

I examined the patient carefully, finding the result as below, and at my request his mother allowed others to see the case also. I can give no idea of the difficulty had in making the examination, and the patience required, which must, in a measure, account for my doubtful statements. I have never seen another such child, so frolicsome, so unrestrained, and so forgetful of the previous moment's caution. He cried furiously and instantly on the least restraint, and slipped about like a sea-serpent. I have since learned that withal he is very affectionate and kind, and popular with all he knows, but I was a stranger then.

RIGHT EYE. V = about $\frac{9}{200}$. Refraction (by the ophthalmoscope), M = $\frac{1}{10}$. With correcting lens, V = about $\frac{20}{100}$, rather less. Pupil seemingly natural size, and fairly movable. Iris sluggish but sensitive and infundibuliform. Subconjunctival veins tortuous and engorged. I could not detect arterial pulsations. Only slight turbidity of the humors. Tension markedly increased. (Glaucomatous cupping not apparent, but found at a subsequent visit to be very plain.)

LEFT EYE. $V = O$. Refraction (by the ophthalmoscope), $M = \frac{1}{8}$. Pupil fully enlarged and immovable, the iris crowding into the anterior chamber. Vitreous turbid; excavation of optic nerve visible. But the lid drooped so quickly under the necessary light that the view was very unsatisfactory. Expression of the eye very dull, and the cornea insensitive. Subconjunctival veins much engorged. Extreme degree of tension.

I was about to leave for the train on a short vacation, and as no operation could be had without home correspondence, a solution of pilocarpine was ordered instilled in the eyes. From various imperative causes without my control, though pilocarpine, and after sufficient trial, eserine also, was systematically used, an operation was not available until September 4th, when, the situation being substantially unchanged, I iridectomized each eye. The cornea of the left eye was very hard, and the iris much congested; the right structures were less affected. The reaction in the right eye was almost nothing; the left was injected, dull, and heavy for about fourteen days. As to vision, the immediate condition was not materially changed from that before the operaation; but the corneæ were sensitive, and the irides less sluggish, the right iris acting quite perfectly. Other changes incident to the changed tension, self-suggestive, were also present, but need not be detailed.

Over three months have now elapsed since the operation was performed. Sight has returned to the left eye, and the vision of the right has steadily improved.

GRAFTS FROM THE MUCOUS MEMBRANE OF THE MOUTH TO SUPPLY DEFECTS IN THE MUCOUS MEMBRANE OF THE EYE.

By W. F. SMITH, M.D., of Chicago, Ill.

As the following case, occurring in private practice, has been an exceedingly interesting one, I take the liberty of presenting it in some detail.

May 18th of this year Mr. C. requested me to see his new-born son, in consultation with Dr. John Guerin. The little patient, three days' old, was suffering from ophthalmia neonatorum. Dr. Guerin related that the birth had been a protracted one, and at its completion the left eye was found to be swollen and already discharging pus. The right became affected the second day. The child was otherwise healthy and well formed.

The left upper eyelid seemed more than ordinarily infiltrated. The cul-de-sac was brought to view with difficulty, but the forced examination caused but very little flow of blood. The central half of the cornea was occupied by a grayish infiltration. The pupil was barely visible, but there was no hypopyon.

The right eye was almost as seriously implicated as its fellow, though the corneal ulceration was not so far advanced.

The treatment consisted in careful applications of nitrate of silver, in 10 % solution, with a camel's-hair brush, the excess of nitrate being washed away with a solution of chloride of sodium. For a few days the applications were made twice a day; later only once a day. The nurse in attendance was instructed to wash the lids, at intervals of a few minutes, with a saturated solution of boric acid, and to keep pledgets of borated cotton, soaked in the solution, constantly applied over the lids.

The purulent discharge had entirely disappeared after three weeks of such treatment. The corneal ulcers never penetrated the anterior chambers, but a broad leucoma covered each pupil. The leucomas gave no evidence of weakness, however, and there was no tendency to bulging.

The lower lids became quite normal in appearance, but a tendency to entropion of the upper lids was noticed, especially during contractions produced by bright light.

As the entropion became so decided that the lashes remained constantly in contact with the corneæ, it was thought advisable to extend the external canthus of each eye. This was done on the 24th of June, by dividing the fibres of the orbicularis underneath a triangular flap of skin, previously dissected directly outwards one quarter of an inch, its base parallel with the median line of the body. After division of the muscle, the point of cuticle was drawn down into the external cul-de-sac by a suture. The extended free margin of each lid was stitched over from mucous membrane to skin by a single thread. The permanent extension secured was about one eighth of an inch.

At first it was thought that this entirely corrected the entropion, but after a few weeks the lashes were again noticed to sweep the corneæ, producing some irritation, and preventing the corneal cicatrices from clearing.

July 21st.—The ends of a loop of tread were passed between the skin and the fibres of the orbicularis from the margin of the lid to the brow, and were fastened by a slip-knot over small rolls of borated cotton. The loop was tightened every morning, until drawn clear through the lid. The effect of the cicatrix thus produced seemed very good, and proved permanently so for the right eye. The inner free margin of the lids had suffered no atrophy—as is the result after trachoma,—and the curve of the lashes had always remained normal.

In a few weeks the edge of the left upper lid was again found turning inwards, the lashes impinging on the cornea. The conjunctiva of this lid seemed almost entirely absorbed, and cicatricial tissue occupied the space between the upper cul-de-sac and the free margin of the lid. It was plain that nothing further could be done without supplying the lost mucous membrane from some source. The requirements of the case seemed to exclude the use of rabbit's mucous membrane; accordingly, on September the 5th, assisted by Drs. Guerin and T. J. Sullivan, I successfully supplied the inner surface of the lid with mucous membrane from the mouth. The details of the operation were as follows :

All the instruments used were previously immersed in 95 % carbolic acid and then washed in hot water that had been boiled. The hands of the operators were bathed in a 2 % solution of carbolic acid. Boric acid was dissolved in boiled water to saturation and used to wash the face and eyes of the patient. A similar solution was used for the sponges, which were of borated cotton. A bowl of sterilized water, containing about 2 % of salt was prepared and kept at a temperature of 98° F. In the latter floated a piece of smooth cork that had been made entirely aseptic.

Chloroform was administered to perfect anæsthesia. A strong thread was passed through the lid near the centre of its free margin, and by means of the loop thus formed the lid was everted over a rubber spatula and held firmly in position by an assistant. An incision was then made on the inner surface of the lid about one line from, and parallel to, its free margin. This incision was carried through the cicatricial tissue, through the cartilage and fibres of the orbicularis almost to the outer cuticle. By drawing upon the thread above mentioned, Dr. Sullivan stretched the wound and made it gape till the inner surface was of normal width.

While the assistants stilled the bleeding the right cheek was everted, exposing its mucous surface. After cleaning it thoroughly with the boric-acid solution, I dissected out a piece of the mucous membrane approximating in size that of the exposed, denuded, inner surface of the lid. I was careful to cut it thick enough to include the submucous areolar tissue. This piece of membrane was then spread out on the smooth surface of the prepared cork and kept saturated with drops of the warm salt water while manipulated, and easily trimmed to the desired shape with a sharp knife. Two needles, that had been threaded on one piece of No. 1 silk, were then passed through one end of the membrane and deeply into the cork. Two other needles were similarly caused to transfix the other end of the membrane ; when the needles were withdrawn from the cork and made to pass through the lid in such a manner as to fasten the buccal membrane over the denuded inner surface of the lid. The threads were tied over pledgets of borated cotton on the outer surface. The mucous membrane was now spread out so as to cover the denuded surface well ; the edge next the cul-de-sac was united to it by two sutures, and two other sutures sufficed to unite the outer edge to the free margin of the lid. All instruments were withdrawn and the lid allowed to resume its normal position. The closed lids were covered with chemically pure boracic acid and a layer of borated cotton which was fastened in position by strips of antiseptic adhesive strip. The wound on the interior of the mouth was closed by sutures.

The little patient recovered from the chloroform nicely, and on the following morning seemed to suffer no pain or other inconvenience. On the second day the dressing was removed, also the threads that had been tied over cotton on the exterior of the lid. There was no swelling or extra secretion or other evidences of inflammation. The eye was thoroughly washed with a warm solution of boric acid, but no attempt was made to evert the lid.

On the fifth day after the operation a solution of cocaine was instilled between the lids, the upper lid was everted, and the remaining stitches removed. They were found firmly united to the transplanted, as well as to the other tissues, so that their removal occasioned the loss of a little blood. Every particle of the transplanted membrane was firmly attached in its new position, and was perfectly healthy in appearance. The entropion had disappeared, the edge of the lid rested in its proper position, and the lashes curved upwards and outwards, well away from the cornea.

I visited the patient as lately as the 12th of October, and found no further tendency to entropion. The corneal cicatrices are rapidly clearing ; the pupils, readily seen through the still imperfectly transparent corneas, are free in the irreaction to light of varying intensity, and our little patient has excellent prospects of good vision.

In the treatment of the inflammatory stage of this case, the great object was to prevent necrosis and rupture of the cornea. To accomplish this a vigorous use of the ten-per-cent. solution of nitrate of silver was deemed necessary. During a rather extended experience with this dreaded disease, I have repeatedly attempted to use other methods and milder remedies, but have had cause to regret it just as constantly. As to the destruction of the mucous membrane that resulted here, I can only say that I watched the cornea with the greatest solicitude, and did not hesitate to use the silver solution in accordance with the indications there in evidence. I am convinced that a milder use of the nitrate would have entailed a loss of the corneal membranes. The violent character of the inflammation—the fact that it had begun before parturition was complete—and the deep infiltration of the left upper lid, may have had the greater effect in the destruction of its conjunctiva.

The order and the successive steps of the operation here described were not suggested by the requirements of this single case, but were the result of some experience in the transplantation of mucous membrane. The former cases seem to be worthy of mention here.

The first was that of a man who had been admitted to Cook County Hospital and assigned to my ward. He was about thirty-five years old, name Finlay, a day laborer, never having suffered from any constitutional disease. Some months before a mass of lime had fallen into his left eye. The result was a complete symblepharon of the lower lid, the free margin of which was attached to the cornea and reached up so far as to hide two thirds of the pupil. The bulb was almost entirely immovable. The operations were made in the amphitheatre of the hospital, in the presence of the hospital surgeons and class.

I separated the lid from the bulb and attempted to transplant the mucous membrane of a rabbit. After covering all the denuded surface of the eye and its lid with the rabbit's membrane, I dusted iodoform over it, also over the closed lids, covered the eye with absorbent cotton, and fastened it in position with adhesive strip. Next morning the house surgeon in charge reported that during the night the patient's temperature had risen to 103° F.; that he had been partially delirious, and had refused all food. On removing the dressing it was found that all that part of the cuticle that had been covered with iodoform was very pale, as if it had been scalded, and that the transplanted mucous membrane was lifeless. All the stitches were removed, the wound thoroughly cleaned with boric-acid solution, and the parts left to heal in their former position.

This is the first and only well-marked case of iodoform poisoning in my experience.

Six weeks afterwards I made another attempt to relieve the patient, but on an entirely different plan. My previous failure with the rabbit's membrane made me loth to try it a second time. After again separating the lid from the bulb, I succeeded in covering a strip of the denuded surface of the globe immediately below the cornea, about one eighth of an inch wide, with conjunctival flaps taken from above the cornea. This was the best that could be done with the available conjunctiva, and it exhausted all ordinary resources in such cases. Not wishing, however, to leave the lower lid to acquire a new deformity, I thought of the possibility of transplanting from the buccal mucous membrane. This idea was acted upon at once, and I transplanted a piece large enough to cover all the remaining denuded surface. Much to my delight the entire piece healed in its new position. Mobility of the eye became perfect, and the cornea cleared up so as to insure tolerably good vision. This occurred in the spring of 1887. I have lately had satisfactory reports of this patient from other patients he has recommended, but I have not seen him personally.

Shortly after having treated the case just described, Dr. Plaum, of this city, brought to me one of his patients, a man about forty years of age, who had lost an eye in youth. He was a laboring man of small means. He had worn a broken, artificial eye, and had otherwise neglected it till the mucous membrane had been almost entirely destroyed. The lids could be separated hardly more than one fourth of an inch. After cutting away the cicatricial membrane so as to be able to separate the lids, I transplanted a piece of buccal membrane, five eighths of an inch wide by a little over an inch in length. No part of it was lost. It all became firmly attached, and though a little cumbersome at first, it was possible, by some careful stretching and patient manipulation, to introduce a small artificial eye. After wearing this a short time he found that he could wear a larger one, and now wears a medium-sized eye with comfort.

These two cases suggested the methods employed in the one here first mentioned.

From all three it would appear that the mucous membrane of the mouth is peculiarly adapted to the purposes of transplantation. I have not seen a complete report of Reverdin's cases. In the September number of these ARCHIVES, however, page 300, Dr. I. Grossman states that "in Stellwag's clinic thirty-three cases of mucous grafting had been reported, twenty-six being done with rabbit's conjunctiva, and the rest (seven cases) with mucous membrane from various parts of the body." He does not specify what parts of the body, but contributes one case of operation for symblepharon in which "the loss was supplied with an oval piece of vaginal mucous membrane."

Numerous circumstances are conceivable which would make such a membrane objectionable, even were it always available; but a large supply of mouth must always be ready to hand.

Since the above has been in print Dr. Knapp has kindly directed my attention to a paper by Dr. Edwin van Millingen of Constantinople in the *Ophthalmic Review* for November, 1887, p. 309, in which the author reports an operation for entropion by which he transplants a strip of mucous membrane from the inner surface of the lip, into a slit made in the free margin of the lid below the in-curving lashes.

The operation described by the present writer in the June number of these ARCHIVES for 1887, p. 177, provides for the transplantation of a strip of skin taken from above the ciliary margin of the lid without pedicle.

Dr. Millingen objects to the skin grafting in such cases because he thinks the fine hairs, usually present on the cuticular surface, would become almost as annoying as the formally in-curved lashes. This objection would appear to be well-founded; but in a number of my cases, which have been under observation for as much as two years, I have observed nothing to be complained of in this regard. Without having tried Dr. Millingen's operation, I cannot help but think the mucous graft would fail to furnish as firm a support to to the overlying lashes as one of skin; and that the latter more nearly simulates the normal tissues at the free margin of the lid.

ON THE EXTRACTION OF CATARACT.

By Dr. J. RHEINDORF, of Neuss.

Translated by J. A. Spalding, M.D., Portland, Me.

MY reasons for publishing the statistics of so few as 273 extractions are to recall the attention of the profession to posterior capsulotomy in scleral extraction, with its successes and failures, to recommend a few alterations in the method of operating, and, finally, to offer a slight contribution to the question of antisepsis in ophthalmic surgery.

The five years during which these cataracts were extracted may be divided into three periods, distinguished less by alterations in technique than by alterations in the care of the patients and in the prophylaxis. To the first period, from 1880 to 1884, belong 203 operations, in which the clinical surroundings and the results were most unfavorable. The patients were mingled together, and although the greatest care was taken to keep from the operating-room all cases that might be infectious, it was really impossible to seclude the patients carefully, at least just before the operation. The prophylaxis consisted simply in cleansing the eye with a weak carbolic solution, in dipping the instruments into boiling water just before using, in bandaging with linen compresses wet in a 5-per-cent. carbolic-acid solution, and over that salicylated wadding and a binocular flannel roller. The same routine was observed at the regular change of dressing once every day in normal cases.

The results in 203 cases, including 24 complicated cataracts, were in 179 uncomplicated cases:

A good result[1]: 80 % = 143 ($S > \frac{1}{8}$).
A satisfactory result: 4.4 % = 8 ($S = \frac{1}{8} - \frac{1}{14}$).
Unsatisfactory result: 5 % = 9 ($S = \frac{1}{15} - \frac{1}{100}$).
Loss: 10.6 % = 19 ($S < \frac{1}{100}$).
In 24 complicated cataracts:

A good result in 20, a satisfactory result in 1, and a loss in 3.

The second period extended to June, 1885, at which time the clinique had been so arranged as to have a special room in which all operations for opening the eye (with the exception of purulent keratitis) were performed. The ventilation was excellent, no other patient was allowed to enter, and all patients for operating were isolated immediately upon their reception. Otherwise the operations were carried on as of old. The 27 uncomplicated extractions then performed gave a good result in 25 cases and a loss in 2.

During the third period, sublimate (1 to 1000) was used for cleansing the eye and its neighborhood before, during, and after the operation, as well as for disinfecting the instrument. The conjunctiva was freely washed out with this solution, the instruments were also placed into it, and then but slightly wiped with linen that had been moistened with the same. After the operation the eye was once more sprinkled with sublimate. If any chronic conjunctivitis or disease of the lachrymal sac was present, the section was made downward so that it could be irrigated eighteen hours later without entirely opening the eye. From the second day the eye was opened once or twice in the twenty-four hours and atropine instilled. Whenever the bandage was changed the lids were carefully cleansed with sublimate and a fresh linen compress moistened with the same applied, then salicylated padding, etc.

Forty-four cataracts were thus operated, but one has been excluded because the patient became delirious on the third day, tore off the bandages, the incision opened, and hopeless irido-cyclitis supervened.

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[1] I have never seen S greater than 20–30 after any extraction, either in my own practice or in that of any ophthalmic surgeon, and I have seen that amount but once, and perhaps a dozen cases of 20–40 in a practice of twenty-six years.

In the remaining 43 cases, of which 3 were complicated, there was a good result in 38, a satisfactory one in 4, and 1 total loss.

The 22 losses in the first group include 3 from retinal detachment, 5 from suppurative iritis, 9 from suppurative irido-cyclitis, and 5 from plastic irido-cyclitis.

In the second period, with 2 losses in 27 extractions, we find 1 of suppurative iritis, and 1 of plastic iritis.

In the third period, containing 43 extractions, we find 1 eye lost from plastic iritis.

Thirty-eight secondary operations were necessary to determine the final amount of vision.

The chief contrast between the first and third period lies in the number of suppurative cases, of which, in the first 203 extractions, there were 14, but in the last 43 none.

Part of this result may be due to increased clinical advantages and skill, yet the sublimate cannot be too highly estimated. Thus, the three complicated cases in the last period were so inherently inclined to infection that I should hardly have dared to operate without the greatest confidence in the sublimate. For in one the eyelids were covered with thick crusts, while symblepharon and pannus were well marked; dacryo-cystitis was present in the second, and trachoma in the third. The authorities advise us to cure these complications before the operation, but who can tell how much must be got rid of in order to avoid infection, or where is the patient who will submit to such a half-way cure? Although preparatory treatment is an excellent thing, there is no longer any such necessity for it since sublimate has been introduced, or, more correctly speaking, the sublimate compensates for any defect in the preparatory treatment. I have never seen suppuration since using it in iridectomies and magnet operations. Moreover, I think that if we use it freely, faulty operations do not trouble us so much as formerly, as, for instance, in the last series of extractions, when too narrow an incision had to be enlarged with the scissors, or when the vitreous prolapsed before the lens had been extracted, or even before the excision of the iris, or when the iris had to be patiently fished for, or, finally, when spoon-extraction became necessary.

The following case of primary corneal suppuration without involvement of the iris proves that sublimate cannot prevent all infection, or, at least, that every suppuration does not depend on infection.

A patient of 84, with a waxy-white skin, submitted to cataract extraction; the conjunctiva tore in several places, but otherwise the operation was smooth. On the next day the eye was free from irritation, but on the second day the cornea became opaque. Atropine, iodoform and sublimate were of no avail. The iris remained unaffected, and without pain or perceptible swelling of the lids the cornea necrosed.

I have never known sublimate in the above strength to injure the cornea. Unfortunately it dulls the knife. If this remedy shall prove the sovereign one against infection and consequently against suppuration, the doubts expressed concerning posterior capsulotomy must be abandoned. It cannot be denied, however, that vitreous lying directly in the incision offers a fruitful territory for the propagation of infection, as well as an obstacle to cicatrization, nor that it thus favors infiltration of the edges of the incision whenever a suitable conjunctival flap has not been obtained.

Although I am inclined to attribute my losses from suppuration to inflection during the operation, yet most of the cases of plastic iritis were, I think, due to other noxious influences. In two cases large pieces of cortex were left in the anterior chamber, in two others the lens was with difficulty extracted, whilst in the remaining three the incision fell somewhat too close to the ciliary region.

I care less than formerly about leaving fragments of cortex in the eye. My previous opinion, that the commingling of the cortex with vitreous lessened the danger whenever fragments of cortex were left behind in the anterior chamber, has been confirmed when the cortex was soft. Still, I am unable yet to decide whether it is the commingling of cortex and vitreous, or the establishment of a free communication between the anterior and posterior segments of the globe, that prevents the outbreak of irido-cyclitis and increased tension despite the swelling of the cortex. It is nevertheless a fact, that whenever at a glaucoma operation I extracted the partially clear lens with posterior capsulotomy, yet left considerable masses of cortex behind, I never met with inflammation or increased tension. On the contrary, in one case in which a colleague half-accepted my method, and removed most of the lens without opening into the vitreous, the tension was permanently increased, and the eye was totally destroyed.

The case is different in cataracts with sticky coherent cortex, those brownish-yellow or brown cataracts in which both the cortex and the nucleus are of nearly the same consistency. Here the capsule and iris probably unite with each other in a few hours after the operation, by those bits of cortex that have not mingled with the vitreous, so that on one hand the iris is irritated, and on the other a bridge is formed over which the vessels of the iris run to the capsule and excite irido-capsulitis. The plethora of both of my patients with this form of cataract may have favored the plastic inflammation, but I am not prepared to say that this or any constitutional dyscrasia exerts any influence in this respect.

I doubt if difficult delivery of the lens is alone a cause of irido-cyclitis. I should rather refer it to purulent infiltration of the lips of the incision, which we used occasionally to see before sublimate was introduced. But in opposition to Schweigger (these ARCHIVES, vol. xvi., p. 284) I refer primary plastic irido-cyclitis to incarceration of the iris and bits of capsule in the incision, which often happens in difficult delivery of the lens, and in spoon-extraction when the incision is too short. The reasons that led me to this belief are that in all of my cases the iritis began from the third to the fifth day, and not directly after the irritation of the operation, but with the cicatrization of the incision, and obstinately resisted all treatment. Therefore I conclude that the transitory irritation caused by the delivery of the lens does not cause the tedious irido-cyclitis, but that this is due to the dragging of the incarcerated portions.

The third cause of irido-cyclitis is an abnormal position of the incision. I have long since abandoned the perfectly linear section so as not to fall into the ciliary region, which we cannot entirely avoid if the incision is to be large enough The flap, as I now make it, is 1 *mm* high, puncture and counter-puncture in the sclera, whilst the rest of the section lies in the corneo-scleral margin, or even in the cornea. The incision in some restless patients fell into the dense tissue at the scleral margin, so that the recovery was protracted, and in three cases plastic irido-cyclitis localized chiefly at the incision excited sympathetic irritation.

In regard to capsular incarceration as a cause of iritis, I would say that this may have occurred much oftener than I once thought, when I now recall the irregular manner in which I used to divide the posterior capsule. It really seems as if when I pushed the hook into the capsule, pulled it through the pupil, and then turned it slightly at the incision in order not to catch it, the capsule must often have fallen into the incision. I now try to loosen the hook from the capsule while still in the eye by pushing it backward, and in case this does not succeed I pull the capsule out and cut it off behind the hook.

The treatment of all subsequent inflammatory processes is antiphlogistic. I never use ice after a normal operation, unless irritation appears within the first day. Moist heat has never seemed of any use except in marasmic patients with the eye free from injection, and the cornea growing opaque; in such cases the flow of blood and the nourishment of the eye may thus be favorably influenced. If the infiltration is yellow though circumscribed, perhaps at the incision, warmth hastens the suppurative destruction by increasing the conjunctival hyperæmia. It also seems contra-indicated if plastic iritis appears during the early weeks after the operation. If then any warm wet applications are made it is simply because I have no idea of restoring the vision, but wish to terminate the inflammation and the pain as quickly as possible. Such at least is my experience, however much it may conflict with that of other operators.

All inflammatory symptoms, especially chemosis, discoloration of the iris, and swelling of the lens, are treated with strong solutions of atropine, cauterization of the external surface of the lids with solid silver nitrate, followed with ice, free scarification of the conjunctiva, and leeches to the nostrils. If the incision or the iris appear to be suppurating, the eye is frequently sprayed and washed out with the sublimate, and powdered iodoform is applied. In this way I have occasionally obviated panophthalmitis, and obtained at least an eye with good looks, even if sightless.

It is best to wait six months before attempting any secondary operations. The delay is indeed long and disagreeable for both patient and surgeon, yet I rarely operate earlier unless the eye is very quiet. Too early interference with broad adhesions between the iris and capsule, or in total occlusion of the pupil, is generally followed by hemorrhages and closure of the newly formed pupil. If the secondary obstruction is simply capsular, then I split it, or extract a bit of the tissue, or I make a preliminary iridectomy and then split the capsule.[1]

The only reason I ever had for performing posterior capsulotomy was to avoid secondary cataract. Although I have not been successful, the results on the whole have been satisfactory. I refuse to operate secondarily in total occlusion of the pupil, or with thick neoplasms behind the iris, or with a bulging iris and decreased tension, even when perception of light is satisfactory. There is but little chance of obtaining useful sight in such cases, and, according to my experience, the danger of exciting sympathetic ophthalmitis is too great to risk the operation for a theoretical improvement of the sight. As things now stand, there is greater reason for performing extraction on the second eye than an iritomy on the first, for a successful iritomy is rare. Nevertheless let me be understood as referring only to neoplastic irido-cyclitis, for which this operation was really suggested, for we all know that a simple secondary cataract can as well be relieved by an iritomy as by any other means.

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[1] The difference between Schweigger and myself in our experience of secondary cataract after posterior capsulotomy (he had 32 %, I had but 10 %) can only be explained by assuming that he simply punctures the hyaloid, whilst I extensively divide it.

Three cases of fatal sympathetic ophthalmitis were observed, and referred to the bad situation of the incision. The sympathetic affection appeared in all the cases about five or six weeks after the extraction; the locality of the operation was very sensitive to the touch; tension decreased, and plastic iritis with deposits on Descemet's membrane was seen in both eyes. Twice the perception of light was satisfactory when the second eye began to be affected. Most of these sad cases are due to what turn out to be unjustifiable consideration for the operated eye; we fear to abandon all hope of restoring sight so long as perception of light remains; we try to obtain a trifle of vision and lose all. It is difficult to predict with any certainty that sympathetic ophthalmia will burst forth, and often after enucleation has been advised by a sagacious surgeon, a less considerate one may save an eye with some form at least, whilst nothing is ever heard of the predicted sympathy. Nevertheless, when the incision has fallen too near the ciliary region, and irido-cyclitis, with bulging of the iris at its periphery, and pain near the locality of the incision still remain five to seven weeks after the operation, I should always advise enucleation. In two cases of extraction on both eyes at one session, suppurative irido-cyclitis ensued in one eye, and the recovery of the other seemed retarded by sleepless nights and mental excitement. Remedies were of no avail, yet all went well after the irritating eye was enucleated. In a fourth case with sympathetic iritis serosa, I enucleated the operated eye and succeeded in saving the other.

It seems as if four cases of sympathetic ophthalmia were very unfavorable to my method, if we judge from the statistics of others where no such accidents are recorded; but at the worst these cases cannot be referred specially to posterior capsulotomy, for it is well known that the scleral extraction excites the sympathy from occasional faulty location of the incision.

Mention must also be made of three cases of iritis serosa following the operation, because in one of them the disease extended to the second eye. The patient was a myope, aged forty-two, of 1-7, with posterior staphyloma. The cataract in the right eye must have developed very rapidly, because a skilful ophthalmic surgeon who saw the patient three months before, made no mention of cataract. Three months after the extraction iritis serosa appeared in the operated eye and in about four weeks in the other. In the other two cases the iritis confined itself to the operated eye. The first traces of the disease were observed two months after the extraction; that is to say, long after the incision had healed. In one case only was the result less favorable, but there are good chances for a secondary operation.

I grant that retinal detachment must appertain to my method, for I never saw it after any other, If we refer to Gouvea's experiments (*Graefe's Archiv*, xv.), we shall be surprised that retinal detachment is so rare in my method, for the loss of vitreous is often large. I think, however that Iwanoff's fears are theoretical, and Gouvea's experiments on animals absolutely worthless in judging the result of loss of vitreous in man. Coarse experimental operations and the restlessness of the animal must have more to do with the detachment than the loss of vitreous. None of my cases were myopic, and all lost but little vitreous. On the contrary, I have seen large loss of vitreous in high degrees of myopia without detachment. So I think my method must favor this accident. It was seen in two cases three months after extraction; the first patient suffering from arthritis, the second from enlarged spleen. It is also possible that the tearing of a very tough hyaloid may have caused the detachment. But I have never paid any attention to this point in any cases.

I do not use cocaine (though I tried it in a few cases), for it makes the eyes very soft, and although there is less danger of loss of vitreous, the extraction is rendered more difficult, owing to the loss of *vis a tergo*, so that the spoon has to be employed. Though I do not dread this step, since the introduction of sublimate, it occasions ruptures of the hyaloid at a spot which does not satisfy the optical relations of the eye, whilst at the same time it is difficult or even impossible to make a subsequent artistic opening in the pupillary field.

The results of scleral extraction, combined with posterior capsulotomy, are so satisfactory that I see no reason to change. The points demanding the strictest attention are the situation of the incision, careful excision of the iris, and the greatest care to avoid incarceration of the capsule in the incision. Losses will always follow extraction, *no matter whether at once or later after the operation.* They are to be expected after interference with so sensitive an organ as the eye. The further we keep from the ciliary region the less our losses will be. In order to minimize the injuries following extraction, we need a detailed statement, not of the successes, but of the failures, and that without any consideration toward the operator. The summary of perfect success, half success, and failure, under the latter of which we include $S = \frac{1}{\infty}$ and $S = 0$, is worthless; it may serve to emphasize the skill of a few operators, or is at least intended to, but practically speaking it would prove more valuable by the addition of details.

CHOLESTERINE IN THE EYE.

By C. W. TANGEMAN, M.D.,

ASSISTANT TO THE CHAIR OF OPHTHALMOLOGY AT THE MEDICAL COLLEGE OF OHIO.

CASE I.—James Mc S., a healthy, white laboring man, æt. 48, when making application at my office complained that he was gradually losing his sight in the right eye, while vision of the left eye had been lost by accident some years ago. A careful cross-examination brought out the following history: About three years since the patient received a perforation wound of the eye. The tang of a fork had penetrated the cornea, lacerated the the iris, and wounded the lens. Sight was almost immediately obliterated, although the patient enjoyed good vision previously. The eye became intensely red and caused much pain and suffering. These symptoms passed away in the course of a few months, leaving the globe somewhat smaller and softer than normal. The pupil was smaller than normal, and irregular; while the iris was a little tremulous. The cornea still showed the point of perforation by a small opacity. The aqueous in the anterior chamber had the appearance of being turbid, with a distinct line of deposit, seen in the lower angle of the anterior chamber. By means of the oblique illumination the turbidity was seen to be caused by a mass of silvery-white flocculi, or crystals, in large quantities. When the eye was at rest this mass gravitated to the bottom, and formed the deposit above spoken of, while on the slightest movement a spray of shining crystals floated round and round in the anterior chamber, passing in and out through the pupil. With the ophthalmoscope the beauty of the picture was very much enhanced. The red reflex from the fundus of the eye made an impression on the observer, that is best expressed in the words of Dr. W. W. Seely, nearly a quarter of a century ago,[1] when describing a case of cholesterine in the vitreous humor. Viz.: "It seemed as though one was looking at a miniature sensible horizon, with all the stars shooting chaotically from their places." The spectacle is a grand one, and was repeated as often as the patient moved the eyeball. A few moments, rest, and the vitreous was again sufficiently clear to see the fundus distinctly. By the reflected light the crystals in the vitreous had a yellowish or golden appearance, while in the anterior chamber with the refracted light they were silvery white. The vitreous, which was liquefied, was completely filled with the same mass. The lens had become absorbed, permitting a ready interchange of fluid between the anterior chamber and the vitreous body, which was shown by the manner in which the cholesterine crystals passed from one chamber to another when the eye was rapidly moved. This patient was kept under observation for some time, but the foreign mass, which while not examined microscopically was undoubtedly cholesterine, did not perceptibly diminish or increase. It did not seem to aggravate the symptoms present, or disturb the vision, which was only quantitative. If this mass is being constantly absorbed, it certainly was just as rapidly reproduced, since it appeared to remain the same for over a year, when the patient was finally lost track of.

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[1] *Cincinnati Lancet and Observer*, 1866

CASE 2.—David S. presented himself at Prof. Seely's clinic, because his eye became periodically inflamed. The patient, a bar-tender, had received a blow on the eye with the fist about two years prior to the application for treatment. From present symptoms, the injury had produced a dislocation of the lens. Intense inflammation of the eye set in, which passed away in the course of about three months without any treatment. The pupil appeared irregular, with a few posterior synechiæ; vision nil. The eye had the appearance of secondary glaucoma. It was subject to occasional attacks of inflammation, which left the eyeball painful for some weeks. The anterior and posterior chambers were filled with a mass of cholesterine crystals, which moved about in the aqueous humor very rapidly upon the slightest movement of the eyeball. A few moments quiet of the eyeball caused a gravitation of the mass to the bottom of the anterior chamber, which gave it much the appearance of hypopyon.

Cases have been recorded where the quantity of cholesterine present in the aqueous humor caused a dimness of vision when it was agitated a while, but when the eye was kept perfectly quiet for some time the patient could read with the greatest ease.

The first case reported is of interest, since instances are rare where the cholesterine was found present alike in the aqueous chambers and vitreous body. True, these two cases, like the majority reported, had both at some time received an injury to the eye, which has always been looked upon by all writers as the prominent feature in the case, or possibly the causative agent. In a dissertation on "the formation of cholesterine in the human eye" by Schaumberg, we find that the subject formerly was looked upon as a disease called cholestearitis (Desmarres).

That these cases were of frequent occurrence during the time when discision of the lens was practised is readily understood, since the dislocated lens not infrequently set up an inflammation which acted similar to the presence of a foreign body in the eye. The cases described by Desmarres,[1] Stout,[2] and Sichel are all such cases where the operator attempted to remove the cataractous lens from the pupillary area by dislocating it into the vitreous chamber. The presence of cholesterine crystals in the eyes operated on as above stated was not due to the liberation of the cholesterine, always found in the lens as some writers think, but carried there and deposited by some process set up by the foreign body. The statement made by Mc Namara in his late work,[3] that "these cases are quite frequent," must be understood. He has made his observations in India, where the operation for the removal of the opaque lens above mentioned, is so frequently resorted to. One thing seems certain, that we cannot look upon any of these cases as idiopathic, nor as a disease, since the presence of cholesterine in the eye may only mean that certain pathological changes have taken place in some of the tissues. It may be observed in the anterior chamber without an affection of the lens, or in the retina without a liquefaction of the vitreous. Yet it has been observed in the vitreous when no disease of this structure could be diagnosed. Its presence in the vitreous does not cause its liquefaction, nor is it likely to be a result of the liquefaction, but the same cause acting on the vitreous body or other structures of the eye may determine a deposition of this excrementitious principle, which is constantly found in the blood. Theories as to the source of cholesterine crystals are few and very unsatisfactory. It is known that the lens and vitreous humor contain some of this principle physiologically, but not in the crystaline form, nor in quantities such as is often seen in the eye, even though it could all be extracted by some process. Lehmann suggests that it is a product of decomposition, but since we know that it is constantly found in the blood, this theory need receive but little consideration. Some authors attribute this condition to an inflammation of the choroid, iris, or retina, but it has been observed a number of times when the eye was in a perfectly healthy condition. Seely,[1] in an article on cholesterine in the vitreous suggests that its presence in the crystalline form is due to a certain morbid state in which its association with the other normal elements is broken, which causes its precipitation in the form of crystal. For a long time it was held that only diseased eyes contained cholesterine. Wolf[2] associates liquefaction of the vitreous with the presence of cholesterine while the vitreous is not by any means diseased in all of these cases. Physiologists claim that the brain, and possibly to a limited extent the general nervous system, is the source of cholesterine, the blood coming from the brain, containing a larger proportion than the blood flowing toward this organ. In the liver it is again separated from the blood, when it passes into the intestine with the biliary secretion. Just how it is formed in health, where a certain quantity is daily excreted, is not known unless we can accept the theory of Rocafull,[3] namely, that it is due to a chemical decomposition of the albuminoids. R. reports a case of cholesterine of the lens and attributes its presence to the origin as just mentioned. Experiments show that patients afflicted with cirrhosis of the liver have a larger amount proportionately of this principle in the blood, but only because this disease hinders its proper elimination.

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[1] "*Traité théor. et prat. des mal. des yeux*," 1847, p. 665.

[2] *Annal. d'oculistique*, 1846, p. 74 ; *ibid.* p. 167.

[3] McNamara, "Diseases of the Eye."

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[1] *Lancet and Observer*, 1866.

[2] "Diseases and Injuries of the Eye," p. 250.

[3] *Monatsbl. f. Augenheilkunde.*

The author is now investigating this class of cases with the ophthalmoscope, with a view to determine whether in these patients where the blood is overcharged with cholesterine it is more likely to be found in the eye. In the four cases reported by Webster Fox,[1] that he calls idiopathic, vision was not materially disturbed, nor was there a lesion of any of the structures of the eye discovered.

Heretofore the presence of cholesterine in the eye and some pathological condition of this organ were always associated. The report of this observation only confirms in the author's mind the belief that cholesterine *may be carried* by the lymph circulation and deposited in the various tissues. It happens occasionally that even rare affections are accidentally associated with well-recognized diseases, which, when considered from an etiological view, is very apt to lead the observer astray. Courtade,[2] reports a case of synchysis scintillans, where these appearances were observed in both eyes two months after the patient had had a shanker, and attributes the presence of cholesterine to syphilis. Possibly the cholesterine disappeared under the administration of iodide of potassium and mercurial ointment. There can be no doubt but that such an association of symptoms was purely accidental. The presence of these crystals in the retina,[3] ciliary body, or anterior chamber,[4] without liquefaction of the vitreous or disease of the retina or lens, would appear to indicate at least that they were not formed there, but carried there by some circulating medium. In the cases termed idiopathic the cause could not be determined by the observer. After analyzing the literature of this subject, we are almost forced to the above explanation. A destructive inflammation of any or all the various structures of the eye could not in and of itself produce cholesterine. It may get into the anterior chamber, as is shown by the patient observed by Van Moll,[1] where the anterior chamber was well filled with cholesterine, which rapidly re-appeared after paracentesis of the cornea had been made. The eye in this case eventually became amaurotic, which necessitated enucleation. A microscopic examination of the lens and its capsule showed that these structures had always been free of any diseased process. The source of the cholesterine was due to a detached retina caused by injury, which found its way into the anterior chamber—how? Why these cases are not more frequently met with when the causes to which the affection has been attributed are daily observed, is difficult to explain.

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[1] KNAPP'S ARCHIVES, vol. xii., p. 179.
[2] *Union méd.*, xxxix., p. 17.
[3] A. v. Graefe, *Graefe's Archives*, vol. ii., p. 219.
[4] De Wecker, *Graefe und Saemisch*,

Little or nothing need be said about the *treatment* in these cases; where the eye is not diseased the foreign mass disappears without any damage to the eye, while its presence in a diseased eye does not change the prognosis. General constitutional treatment has been recommended.[2] Hyvernat reports a case where a large mass of cholesterine was found in the healthy vitreous body, while the choroid was diseased. This case may suggest a solution why so often cholesterine is found in eyes where the vitreous is liquid, as a consequence of disease elsewhere. It has been found in the anterior chamber, where it could not have reached this space only by the lymph circulation. It has been found constituting small tumors of the middle ear,[3] without any manifest disease of this organ. Graefe[4] records a case of purulent inflammation of the lachrymal sac where the discharge contained enormous quantities of cholesterine. Tröltsch[5] speaks of its occurrence in a purulent discharge from the middle ear. It has been found in abnormal quantities in almost every structure of the body. Its presence could not be explained in any manner than that the lymph or blood circulation, or both, was the channel through which the cholesterine crystal found its way into the various structures. From the observations of Seely, Fox, and others, the term scintillating synchysis is objectionable, inasmuch as we may find cholesterine in the vitreous, or even other parts of the eye, without a liquefaction of the vitreous humor.

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[1] *Weekblad. van het Nederl. Tijdschr. voor Geweesk*, ii., 595.

[2] *Lyon médical*, xxxiii.

[3] Kuhn, *Arch. f. Ohrenhkunde.*, vol. xxvi.; Schwartz, *Chirurg. Krank des Ohres*, S. 221.

[4] *Arch. f. Ophthal.*, vol. iii., 2, 357.

[5] *Lehrbuch der Ohrenhkunde.*, S. 425.

A CASE OF NASAL COLOBOMA OF THE CHOROID.

By Dr. G. E. de SCHWEINITZ,
OPHTH. SURGEON TO THE PHILADELPHIA AND THE CHILDREN'S HOSPITALS ;

AND

Dr. B. ALEX. RANDALL,
OPHTH. SURGEON TO THE EPISCOPAL AND THE CHILDREN'S HOSPITALS.

(*With a colored plate, Tab. iv. of vol. xix., Germ. edition.*)

THE following case is believed to present a unique form of congenital anomaly, and as such to be worthy of being placed upon record.

During May, 1885, Thomas H., unmarried, aged twenty-two, applied for treatment on account of a severe attack of serous iritis in the left eye. *History.*—Father and mother living and healthy ; four living sisters, two of whom are in delicate health on account of pulmonary disorders ; one brother died at birth, and one sister in early infancy from unknown causes. None of the family have ever had inflamed eyes ; the patient had the ordinary exanthemata of childhood, but has never had any severe illness during his lifetime. For a year previous to his present trouble he suffered with neuralgia, chiefly in the distribution of the left supraorbital nerve. He has also had brachial and intercostal neuralgia, a short laryngeal cough, and is asthmatic. He denies all venereal disease, and has never previously had an inflamed eye. Three years ago he was struck by a shuttle on the left side of the bridge of the nose, but this accident was not attended with any serious local damage to the nose or the eye. For two weeks before the onset of the iritis he suffered with constant orbital and periorbital neuralgia. The vision appeared equal in each eye. The condition at the first visit was as follows :

R E, $V = \frac{20}{xx}$; Jr.1. 6″– 18″.
L E, $V = \frac{20}{c}$.

R E.—Large, round disc, shallow excavation ; retina striated ; low H.

L E.—Fine pericorneal injection ; cornea hazy, and numerous punctate opacities on Descemet's membrane ; iris discolored ; no distinct view of the eye-ground ; nerve greenish and deeply cupped ; veins large and tortuous ; the upper central artery lost as it approaches the nerve ; lower vessels still more indistinct ; at the lower and inner side of the disc a large indistinct whitish area ; above, a reddish patch, probably a retinal hemorrhage.

The patient was put upon iodide of potassium and bichloride of mercury, and directed to use atropine drops locally. He came daily for treatment for one week, and then disappeared for four months. At the expiration of this time, during which he had more or less continuously used his remedies, he came again. The eye was now white and quiet, a few floating vitreous opacities were detected, and a clear view of the fundus, presently to be described, obtained. Both eyes were atropinzed, and the refraction error corrected. This proved to be O D, + 0.65 $S\frac{15}{xv}$; O. S, + 0 90 $S\frac{15}{xx}$. These glasses were ordered, and compound tincture of cinchonia and bichloride of mercury given internally. He was not seen again for nearly two years, when he returned on account of chalazia on the upper and lower lids of the left eye. These were dissected out, and the cuts healed satisfactorily. One year later, December 1887, having broken his glasses, he came again ; and then the following study was carefully made :

The ophthalmoscope shows in the right eye the optic disc large, round, and outlined by a black and generally sharp-cut pigment line. There is a large shallow dish-like cupping of its surface and a yellowish-red conus downward, perhaps underlying its lower segment. The retina is striated, especially along the larger vessels ; and conspicuous glistening striæ are visible between the disc and the macula. The general condition of the eye-ground is good, and the macula normal. There is low H.—Vision is $\frac{20}{xxv}$? raised to $\frac{20}{xx}$? by + 0.65 sph. ; and accommodation is D = .25 p.p. 14 cm.

In the left eye the disc is also large, as on the right ; but the cupping of its surface is more marked, especially to the lower nasal side, where it shows a decided greenish coloration increasing toward the margin. A yellowish conus at the outer side, bounded by a sharp-cut black band extends upward into a rounded patch of choroidal atrophy and pigment heaping just below the upper temporal vein ; and similar disturbance of the choroid embraces the upper margin of the disc. To the nasal side of the nerve and a little below its level is a rounded whitish area tangent to the disc, vaguely marked above and out, and separated from the disc by a band of peculiarly brown pigmented choroid. A large vein, lower nasal, crosses this area nearly in its horizontal diameter, receiving two extremely tortuous vessels in the middle, and bending sharply at its overhanging nasal margin. This area is greenish-white, and opalescent in its central portion, and depressed below the general level of the eye-ground, its deepest portion near the lower nasal edge requiring — 3. D to bring it into clear view. Only the lower and nasal margins are abrupt ; and there a band of yellowish, partly pigmented choroid surrounds it, outlined beyond by a strong black band. The other margins are shelving, especially the upper-outer, where the brown mottling in which the choroid loses itself is extremely peculiar. A falciform outgrowth, greenish and semi-transparent, arises from the emergence of the vessels upon the disc and extends its sharp edge some 3. D forward into the vitreous. It reaches upward and downward, somewhat concentric with the margin of the coloboma, and loses itself at its extremities in fine threads stretching forward into the vitreous, the lower termination being less visible and less prominent than the upper. A small semi-detached vesicle, 3–4 D in front of the eye-ground, floats over the nasal margin of the disc. The remainder of the eye-ground is normal, except for the marked striation of the retina at the posterior pole, as in the other eye. The refraction is low H. ; $V = \frac{20}{\text{xxv}}$?? raised to $\frac{20}{\text{xx}}$? by + 0.90 sph.; and the accommodation is the same as on the right. There seems an enlarged blind-spot ; but with quantitative perception of light in the region of the coloboma.

It is altogether probable that we have here acquired, as well as congenital lesions ; and it may be assumed that the choroidal disturbance above the disc is of the former character. The falciform membrane, which extends out from the disc as a thin, stretched, and non-vascular membrane, is probably congenital ; and was doubtless present, hiding the vessels, at the first examination. The rounded coloboma, which presents almost all of the usual features of such anomalies, cannot but be congenital; for it was certainly present within a few days after his inflammatory trouble began, and has undergone no notable change since. Nothing but its unusual position would seem to call at all in question its character as a choroidal coloboma of the ordinary type—an arrest in development and non-closure of the fœtal cleft. It is not unusual to find a small coloboma of the choroid below the disc, inclining slightly to the nasal side, as in the case reported by Mittelstädt, where the iris showed a "pseudo-coloboma" horizontally inward; but no case has been found on record where the choroidal cleft lay, as here, wholly to the nasal side. The problem of its genesis we leave others to solve.

Description of Plate IV.

NASAL COLOBOMA OF THE CHOROID.—Erect image of left eye, showing the rounded greenish-white area to the lower nasal side of the disc and the crescentic falciform membrane projecting into the vitreous. The nasal margin of the coloboma is seen to be overhanging, and hides the vein which turns over its edge; the opposite side is shelving and shows the thin pigmented tissue, which represents the lacking choroid. Pigment disturbance (pathological ?) is seen above the disc and the marked glistening striations along the vessels and at the posterior pole. The general level of the eye-ground was seen with + 1., the deepest part of the coloboma only with − 3. D.

TWO CASES OF EPIBULBAR CARCINOMA, FROM THE SURGICAL CLINIC IN BONN.

BY DR. C. HEYDER, OF MUNICH.

(*With three illustrations.*)

Translated by Dr. J. H. SHORTER.

IN the present paper are reported two cases of pure epibulbar carcinoma, which, early in 1884 and in January, 1886, respectively, came under observation at the surgical clinic in Bonn, the reporting of which was kindly entrusted to me by Prof. Frendelenburg.

As cases of epibulbar carcinoma have been only rarely observed (as will be seen later the entire literature embraces only some thirty cases), the two here reported are deserving of special interest, from the fact that in none of the other cases described did the tumor attain to such a size as in these two.

As, furthermore, both of these cases were operated on, and the macroscopical as well as histological conditions thoroughly examined, an opportunity was afforded of going carefully into the subject, making a comparison with those hitherto reported not without interest.

The first case has been already used in my inaugural dissertation.[1]

Case 1.—Anna Maria V., unmarried, fifty-two years lod, from Heidgen, near Witlirschlick, was admitted to the surgical clinic, on July 14, 1884, for the extirpation of a large tumor, which sprung from the globe of the right eye.

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[1] On Enucleation of the Globe on Account of Epibulbar or Palpebral Carcinoma.—Bonn, 1885.

The patient made the following statement as to previous affections :

Sight had begun to weaken in both eyes at the age of ten. Twenty-five years ago the patient was ill with variola, which raged in her native village at that time. She still retains marks of the disease quite distinctly. Whether the eyes were affected by the variola could not be ascertained from the history. In 1863 she was treated at the ophthalmic clinic for granular conjunctivitis of both eyes. When she came under observation in 1884, it was found that the function of the remaining eye, the left, was considerably reduced through pannus and keratoconus.

In the spring of 1879, so she stated, the right half of the face, especially in region of the eye, was attacked with erysipelas. In May, 1883, the patient first noticed a small elevation on the right eyeball. The exact spot occupied, whether the sclero-corneal margin or only the corneal region, could not be ascertained. The patient, however, claimed that for a long while before there had been a white spot at the point first attacked, which was caused by one of the eye diseases. Whether this spot had been a scar, the result of one of the eye affections, we cannot at present decide. This tumor soon increased to the size of a pin-head ; by September it was about as large as a walnut, and from that time it grew more and more rapidly. At the same time the tumor became the seat of severe, spontaneous pain, which greatly increased on touch. The patient also states that the tumor now commenced to bleed at the slightest provocation, and a considerable quantity of purulent fluid was discharged from its surface. When the woman was admitted to the clinic, the region of the right eye was found to be occupied by a nodular tumor the size of a hen's egg, which on all sides overhung the orbital margin. Of a general globular shape, it presented a many-fissured surface, on which here and there could be recognized traces of recent hemorrhages. The tumor protruded from the orbit like a large mushroom. The eyelids could not be recognized either from in front or from the side ; in order to bring them into view it was necessary to draw forward the upper and lower borders of the tumor. Then it was seen that unfolded they rested upon the convex surface of the tumor. No part of the globe could be made visible, as it was completely covered by the mass ; but its existence could be presumed from the fact that all movements of the other eye were accompanied by similar coincident excursions of this mass, until restricted by contact with the edges of the orbit.

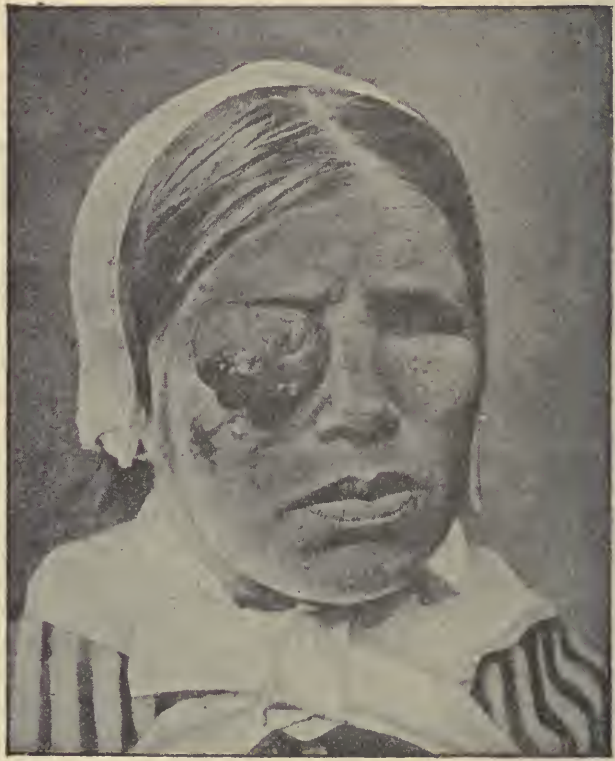

Fig. 1.

The visual power was ultimately destroyed, the patient being no longer able to distinguish between light and dark. The frontal nerve seemed to be also indirectly implicated, as the patient described the feeling of formication in the parts of the skin supplied by that nerve.

Swelling of the glands was not demonstrable anywhere, and the general condition was likewise fairly good. The tumor was extirpated, along with the globe, on January 22, 1884, incision being made directly on the orbital margin. The entire contents of the orbit were removed, and no attempt was made to cover the defect by a plastic operation. The bleeding cavity was tamponed with iodoform gauze, over which was applied a bandage. Later some indifferent applications were brought into use. By this treatment the course of healing was undisturbed ; neither fever nor any local inflammatory reaction was observed. As early as the 11th of February, the patient was allowed to go home, with the wound well granulating, into which on all sides the skin was being drawn. On her departure the granulating surface was only 2 *cm* long by ½ *cm* wide.

On May 29th the patient presented herself at the clinic again. The healing had made very good progress. There remained a granulating spot twice the size of a hemp seed, corresponding to the centre of the original wound. No relapse.

On December 5th the patient was again in the clinic ; the healing had been perfect for a long while. The orbital cavity seemed diminished, and the eyebrow was somewhat pulled down, so that it was partly below the supraorbital margin. There was still no trace of any recurrence or of any enlargement of the lymph glands to be observed.

REPORT ON THE MACROSCOPICAL CONDITION OF THE TUMOR.

The extirpated growth, viewed externally, appears like an irregular nodular projection of about the size of hen's egg, separated by shallow depressions into several portions. The surface is rough ; everywhere papillæ, some small, fine, others thicker, are discernible. Along the whole under surface, hidden from view, lay the lower lid completely everted. The upper eyelid is less well preserved, the conjunctiva especially being drawn over into the surface of the tumor, so that the free margin of the lid rests directly on the latter.

The globe, in sagittal section, seemed to be quite well preserved both as to shape and size. The tumor covered it as if it had been poured over the eye, in front covering the cornea completely and extending backward upon the sclera beyond the equator (see fig. 2). The measurements are as follows : The greatest thickness downwards is 16 *mm*, and forwards 12 *mm ;* above, the thickness varied between 11 and 17 *mm*. See fig. 2, which represents a diagrammatic section of the tumor, in order to show its relative shape and size.)

The globe must therefore evidently have been drawn forward with considerable elongation of the muscle and optic nerve, as the posterior border of the neoplasm rested above and below against the orbital margin. The globe must likewise have been turned downwards, as the tumor extended above farther back than it did below. To a point beyond the equator, the tumor not only lay close on the sclera, but seemed also united so fast to the latter that it was only by violence possible to separate one from the other. The structure of the sclera, however, was unchanged so far as this could be determined macroscopically.

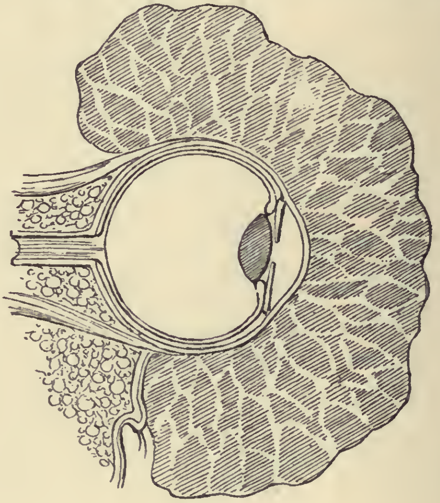

FIG. 2.

The cornea was nowhere perforated, though in the upper half it seemed strikingly thin ; in the lower it was of normal thickness. In the centre the tissue of the tumor passed directly into that of the cornea, so that here the dividing line between normal and pathological tissue could no longer be recognized ; the posterior surface of the cornea, however, was perfectly smooth. The tumor itself showed a radiate arrangement, and in the deep parts adjacent to the globe was more compact, but externally of a delicate, cauliflower-like structure. Iris, retina, and choroid, as well as the optic nerve and the muscles, presented nothing peculiar.

MICROSCOPICAL CONDITION.

Section perpendicularly through the entire thickness of the tumor and through the corneo-scleral junction.

The sclera is essentially unaltered, well supplied with blood-vessels, partly of a capillary character, partly showing clearly the structure of the arteries and veins. Lying upon it is found a tolerably thick connective-tissue layer, isolated spots in which appear strongly infiltrated with round cells. Then follows the tumor, the papillary structure of which, recognizable even macroscopically, now becomes very apparent. The epithelial masses, arranged like palisades, open outward, pushing outwards, while in some parts of the elongated papillæ a remnant of connective tissue containing blood-vessels can still be recognized. The more external the more the epithelial masses predominate, and are more closely found together, so that only here and there a cleft can be seen between the papillæ.

The cornea is relaxed, that is, abnormally wide spaces are found between the individual layers; this disruption is especially distinct at the sclero-corneal margin. Interposed between the tumor and cornea there is a connective-tissue layer of a scar-like character and of like thickness as the cornea itself. It is a continuation from the loosened connective-tissue layer, which has been described as lying without the sclera. It extends, gradually diminishing in thickness, over a fourth of the cornea. Beyond it the epithelial masses are directly on the slightly loosened cornea, the structure of which is but little altered, while spurs penetrate here and there into its tissue.

In the external layers of the tumor the epithelial new formations present in general a papillary arrangement; the individual strands, however, are stouter, in part club-shaped; leaving larger interstices in the perforation.

Some quite large blood-vessels course through the connective-tissue processes, which lie in the interspaces, and which also in part push into the base of the papillæ. These processes show likewise very strongly marked round-cell infiltration. In general, however, the gross structure of the tumor mass retains a radiate arrangement.

The picture of transverse and oblique sections through the tumor is an extraordinary irregular one. Large masses of epithelial cells, traversed by bands of connective tissue, are chiefly to be seen; especially in the latter numerous blood-vessels are visible, in part arterial with thin walls, in part quite broad capillary loops.

The epithelia themselves are relatively small, but distinctly recognizable by the large nucleus with glistening nucleolus; they vary in shape, although chiefly oblong, their edges being directed inwards and outwards.

The anatomical diagnosis, therefore, would be—epibulbar carcinoma. It was impossible, from the size of the tumor, to determine, from the anatomical examination, the point of origin.

Case 2. This was that of a peasant, Johann H., fifty-five years of age, from Ketting, near Neuwied.

The vision in the left eye was said to have been almost entirely lost ten years previously, through a disease which was not very painful, concerning the nature of which nothing could be learned. The patient stated that "a film" came over the eye, which constantly increased in density. Later, about two years ago, a bulging of the cornea developed, occasionally burst, and, after evacuation of the fluids, became smaller. Furthermore, in the meantime, a small tumor appeared at the place where the cornea perforated spontaneously. At that time the patient had already been advised by a physician to have an operation performed, but as he still regarded the affection as not important, the operation was not undertaken.

In the last two months the tumor has grown very rapidly, and occasioned the patient severe pain, which caused him, on January 4, 1886, to seek aid at the surgical clinic.

The appearance which the region of the left eye presented at the time of his reception was about as follows:

The eyelids (especially the under one) are pushed forwards and stretched; they enclose an immense palpebral fissure, which remained constantly open, the patient not being able to completely close it. The skin of the eyelid is livid in color, somewhat œdematous, and traversed by large, engorged veins. The surface shows some unevenness, which, as shown by palpation, is occasioned by the corresponding irregularities of the parts lying below.

The lids are movable over the subjacent tumor, except that along the palpebral fissure the lower lid is for its entire length bound fast to the tumor, whereas the border of the upper is only in connection with the tumor for a small space at the inner canthus. The consistency of the tumor is somewhat dense.

In the palpebral fissure nothing can be recognized of the globe, being filled with the tumor masses, which constantly secrete a small quantity of puriform fluid.

The part of the visible surface belonging to the lower portion of the tumor is smooth throughout, only here and there interrupted in continuity by a large cleft. The upper parts situated in the palpebral space are, however, much fissured, especially towards the inner canthus, so that they present a delicate, cauliflower-like appearance.

The pain extended beyond the limits of the tumor into the region of the supra-orbital nerve ; pressure on the spot where the nerve issues from the supra-orbital notch was extraordinarily painful.

The operation was performed on January 9th. As the skin of the upper lid was unaffected it was preserved, in order, later on, to cover part of the defect ; only at the inner canthus, where it had become involved in the growth, a small part had to be removed. The conjunctiva of the upper lid was divided by a cut in the neighborhood of the fornix, and detached from the parts below.

Then a cut was made around the lower part of the tumor, from the inner to the outer angle of the orbit, preserving only a narrow strip of skin of the lid. Next the entire contents of the orbital cavity were evacuated, the tumor and with it the globe being shelled out, and finally the optic nerve was divided from the outer side with the scissors.

At the operation the tumor was found to be nowhere adherent to the adjacent bony parts, neither did it fill the entire posterior part of the orbit. Chisel and hammer were therefore not required to remove the bony wall.

The hemorrhage was not very considerable ; ligation of two arteries checked it.

After the completion of the operation, the portion of the skin which was retained was utilized as a partial covering for the defect which had been occasioned. A few stitches were inserted at each angle, for uniting the upper with the lower lid, so that the raw surface still remaining was not very large. Even this could have been corrected by transplantation of a flap from the skin of the adjacent parts, but having the experience of the first case in view, this was abstained from. Finally the wound was aseptically cleansed and dressed, and a bandage applied covering all.

The course of the healing was entirely without fever. At the first change of bandage, six days after the operation there was moderate suppuration. A few days later the bandage was changed again. The surface of the wound was covered with good granulations; very little suppuration. On the 22d of January, at his urgent request, the patient was discharged. Three months later he informed us that the healing process had gone on undisturbed and that the wound was entirely closed. No sign of any relapse as yet. With the exception of the neuralgia previously mentioned, which occasionally returned, the condition of the patient is excellent.

REPORT OF THE MACROSCOPICAL EXAMINATION.

The extirpated tumor was of about the size of a hen's egg. Looked at from in front the greater part of the growth was seen to be covered with the skin of the lower lid, which is clearly recognizable by the eyelashes. Above is seen that part of the tumor already described as lying in the palpebral fissure; and uppermost of all, the exposed part of the growth, divided by coarse and fine fissures into small nodules and papillæ. A small portion of the growth in this region is covered by the small piece of skin which was removed during the operation.

Description of a sagittal section as shown in Fig. 3.

The globe seems atrophied and very much changed in shape, having become of an oval form through pressure of the masses of neoplasm above and below. Evidently these changes were due to the resistance offered to the growth forward of the tumor by the skin which stretched over it. The tumor lay closely attached to the globe as far back as the equator; above, however, an obtuse border projected back and beyond this zone. The large portion of the tumor appeared as a consistent homogeneous mass, only here and there divided by intervening spaces into lobes.

One large fissure was especially striking, leading from the palpebral opening downwards and backwards into the tumor and dividing it into two not exactly equal parts.

The measurements of the tumor are as follows: The total width of the growth amounts to 53 *mm;* the width on the sagittal section, at a point lying opposite the optic nerve, is 9 *mm;* of the portion covered by the lower eyelid, 30 *mm.* The greatest projection of the growth upwards, measured from the upper wall of the globe, amounts to 12 *mm,* and that downwards, reckoned from the lower wall, to 39 *mm.*

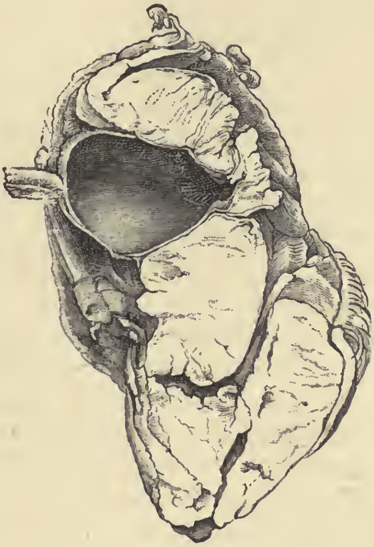

FIG. 3.

The sclera does not seem to have undergone any changes in its structure, but the cornea is ruptured and gapes; there is no anterior chamber. The masses of neoplasm which have insinuated themselves between the gaping halves of the cornea, and embrace them from within and without, have not, however, produced atrophy of the corneal tissue. The outlines of the cornea can be clearly traced deep into the tumor (see fig. 3).

The arrangement of the tumor can be distinctly recognized, even macroscopically, as a radiate one, the centre lying at the point of rupture of the cornea.

The iris lies unchanged in the cavity of the globe, nor can any changes be perceived macroscopically in the other coats of the eyeball.

MICROSCOPIC EXAMINATION OF THE EXTIRPATED TUMOR.

Section made in a sagittal direction through the growth and the globe at the spot where the continuity of the cornea is interrupted.

On the outer side of the cornea, which stretches into the tumor mass, lie broad bands of long epithelial cells, which are placed close together broadside on to one another, with no tissue whatever between them. Some of these bands extend a short distance parallel to the cornea, and then bending out radiate into the growth. The others, especially those belonging to the anterior portions of the cornea, go directly in a straight line from the cornea. In their further course, after ramification, they disappear in the growth, and thus effectuate the radiate arrangement of the remaining tumor masses.

In the section through the globe, both halves of the cornea, which diminish gradually in thickness the deeper they penetrate into the growth, so that they cannot be followed to their termination, present a peculiar appearance under the microscope. In the posterior portion, towards the globe, the cornea has preserved its normal thickness, having yielded to the pressure of the tumor and been pushed into the cavity of the anterior chamber, there being no counter-pressure at this point against the inner surface of the cornea. In the central portion, on the contrary, the cornea has become thinner, but its structure has become more compact. This behavior is very easily explained by the fact that, whilst the growing tumor exerted pressure on the surface of the cornea externally, the latter was prevented from bulging or otherwise yielding to such pressure, by reason of the presence of masses of the tumor between the two halves of the cornea, which kept them apart.

The more anterior the further the cornea departs from its normal shape. Here the cells, having proliferated most luxuriantly towards the torn ends, split the cornea into lamellæ, between which they insinuate themselves. Whilst further back this cleavage is single, it becomes more and more numerous towards the ends, the individual lamellæ becoming constantly thinner, until finally they disappear in the tumor, ramifying in every direction in layers of various breadth.

The portions of the tumor which are found between the halves of the cornea are shown under the microscope to have had their origin in the anterior parts of the cornea. The rows of cells here turned inwards are in close contact with those coming from the other side, and thereby have pushed apart the gaping cornea.

The tumor itself proved to consist chiefly of epithelial cells. In the neighborhood of the cornea, the said cells are closely crowded together; in the external parts of the growth they become larger and irregularly shaped, and show distinctly, in addition to the large nucleus, a glistening nucleolus. Larger masses of cells are traversed by connective-tissue bands, and enclosed in them. There can be also recognized in the connective tissue, cross and longitudinal sections through blood-vessels. There are no changes in the remaining portions of the globe.

Remembering that there was a division of the cornea, and that, furthermore, changes were first noticed at the point where this division had occurred, it naturally suggests itself to the mind that just here the development and spread of the growth had its origin. Observation of the tumor on the sagittal section, which was made right through the affected part of the cornea, confirms this opinion, as a radiate arrangement of the grosser parts of the tumor, proceeding from the lacerated cornea as a centre, is distinctly recognizable, even with the naked eye.

This behavior becomes still more apparent from the microscopical examination, as above mentioned.

In this latter case we have one of very great rarity to deal with, so far as concerns the origin of the growth. In the majority of cases mentioned in the literature of the subject, no etiological factor could be pointed out, whereas in this one the carcinoma undoubtedly originated from a scar.

Besides this, almost all known cases are distinguishable by the seat of the tumor, which is specified as in the highest degree characteristic of corneal tumors.

It is, for example, generally specified by authors that the tumor was located at the sclero-corneal margin, when speaking of a small growth; when describing a larger one, that it extended over the sclera and cornea, but showed a firm attachment only with the sclero-corneal border, whilst everywhere else it could be easily lifted up. Our case has, in common with the other, the fact that the changes in the corneal substance itself were inconsiderable; there was also no tendency towards proliferation into the interior of the globe, notwithstanding that there already existed an opening in the cornea.

From these experiences it seems that epibulbar carcinomata have very little tendency towards invasion of the neighboring parts, a fact which naturally carries great weight in the question of an operation. Furthermore, a relapse does not easily occur after an evacuation of the orbit on account of such growths, as is shown by our first case. The second cannot be very well cited as proof of the fact, as the time which has elapsed since the operation is too brief.

In looking over the literature one is struck with the fact that the authors, almost without exception, are silent as to the question whether, after evacuation of the orbit, a plastic covering should be made or not. Genzmer is in favor of a secondary transplantation of a skin graft upon the granulating defect. Whilst Prof. Trendelenburg formerly (following the precedent of v. Langenbeck) always formed a compensation flap out of the surrounding skin, he has, in recent times, performed the operation without attempting any plastic covering. The excellent result obtained in both the above-mentioned cases, as also after extirpation of the globe for other indications, is demonstration of the correctness of this procedure. Also where both eyelids must be removed and the entrance into the orbit remains exposed, the surrounding skin is drawn so strongly towards the orbit that, when the cavity is filled with granulations, a complete covering of skin exists over the funnel-shaped opening. There remains a shallow trough, covered at the borders with skin, in the centre with a scar, which is relatively only slight disfigurement, and the patient is spared the large scar on the forehead which remains after the plastic operation.

As supplement to this paper, I may be allowed to present a short sketch of the most important facts which have thus far become known regarding epibulbar carcinoma. Such a collection is not without interest, as some of the authors have made reports as to the macroscopical and histological conditions observed, as well as in regard to the therapeutics employed and their results.

In the ARCHIVES OF OPHTHALMOLOGY AND OTOLOGY, 1878, vol. vi., p. 291, there is an article by E. S. Holmes, of Chicago, on thirteen cases of ocular tumors, one tumor of the optic nerve, and one case of panophthalmitis with a coagulum, which was mistaken for a tumor.

The writer first presents a short survey of the different forms of tumors of the eye which he had an opportunity of collecting in his own practice, comprising 20,000 eye patients. Among the great mass of material he found only two cases of epithelial cancer of the sclera and cornea. One of these cases the author briefly reports as follows :

M. H. C. H., forty years of age, noticed, two and a half years before the removal of the eye, and first at the margin of the cornea, a small, painless elevation, which grew rapidly. In the course of a year and a half it was twice removed and frequently cauterized with nitrate of silver. But as relapses constantly followed, enucleation was performed. The tumor was of a round shape, ⅓″ in diameter, 1½‴ high, with sharp borders and yellowish and ragged surface.

The vision had remained almost entirely unaltered, as the growth hardly reached the pupillary margin.

The microscopical examination showed that the tumor was firmly united to the cornea and sclero-corneal margin ; a part of it, however, simply lay over the sclera. The growth consisted simply of epithelial cells lying piled upon one another. The greater portion of the cornea was destroyed by the epithelial proliferation or already permeated with epithelial cells.

Steffan, in *Zehender's Klinische Monatsblätter*, 1864, vol. ii., p. 81, publishes the following case of medullary carcinoma of the cornea:

H. F., fifty-two years of age, presented himself in 1862. In the lower outer quadrant of the left eye the cornea was covered by a partially brown pigmented growth. The consistency of the tumor was soft, its surface uneven; the height was 1‴. It was furthermore not movable in the cornea, and ended in sharp borders about 1‴ from the pupil. The conjunctiva showed here and there brownish pigment plaques.

For six months the tumor remained the size of a pin-head, without causing any annoyance. Six months later the patient presented himself for operation, the tumor in the meantime having increased in height to 3-4‴.

On removal of the growth it was seen to be in intimate connection with the sclera and cornea only at the border; otherwise it was easily lifted up.

The microscope showed a mass of cells almost without stroma. The cells were round and contained one or two shining nuclei.

In the same periodical for the year 1869 Keyser describes an operation for removal of a cancerous growth from the surface of the eyeball:

The patient, a young man of nineteen, had noticed for two years a red spot on the corneo-scleral margin. The significance of this spot was mistaken by his physician, and treated as a pterygium with astringent washes and caustics, which treatment, however, seemed to stimulate the growth.

There is now present a reddish tumor, which reaches about to the pupillary border and extends over the sclera. It is 7 *mm* in length and 6 *mm* in width. It is firmly united to the cornea and sclera. The pain caused by it is bearable. A small cancerous tumor had been previously removed from the nose. The vision of the diseased eye was intact; the other eye was blind from an injury. The growth was carefully extirpated, and healing followed by first intention. Two years later there had been no relapse.

As to the results of the histological examination the author gives no details, but contents himself with the statement that the tumor showed a cancerous structure.

In vol. vii., p. 51, *l.c.*, Colsman reports a case of epithelioma of the cornea :

A man, sixty-seven years of age, had in the right eye a round tumor of about $2\frac{1}{2}'''$ diameter and white color. Through a hand lens many small elevated points of a papillary nature were seen.

The tumor began a line below the border of the cornea and projected up not quite to the lower margin of the pupil. It had abrupt borders and an elevation of $\frac{3}{8}'''$.

One year later the patient showed himself again. During this time the tumor had grown and now reached to the middle of the pupil. The man refused an operation.

Finally from vol. xviii., p. 178, we take a case of cancer of the sclera-corneal margin, described by Knies :

Mrs. R. F. had at the inner corneal margin of the right eye a reddish-yellow uneven growth, which had existed for a long time and was painless ; its shape was that of an isosceles triangle, the base of which, corresponding to the corneal margin, measured 3 *mm* and the altitude 4 *mm*.

The growth was extirpated and examined microscopically. There was found an enormous proliferation of epithelial cells, with manifold excrescences into the conjunctival tissue. Even beyond the borders of the tumor the conjunctival tissue was infiltrated with round cells in the shape of so-called epithelial nests.

The tumor cells were more than double the size of those of the normal epithelium of the cornea and conjunctiva. The line of demarcation separating them from the normal epithelium was very distinct. In the sections which had been stained with hæmatoxyline the nuclei of the tumor cells were much more deeply tinged than those of the normal epithelium.

The seat of the tumor was in the cornea and in fact outside of Bowman's membrane. Whilst in isolated places the portions of tumor resting on Bowman's membrane had displaced the normal epithelium, there were, on the other hand, places where the corneal epithelium had been lifted up and served as a covering of the growth.

In *Nagel's Jahresberichte* are found several cases—1870,

p. 290 *ff.* Lebrun: Tumeur épithéliale du globe oculaire (*Annal. d'Oculist.*, vol. lxiv., p. 132):

> Within the space of 7 or 8 weeks a tumor had made its appearance in a man, sixty-three years of age, which grew to half the size of a hazelnut. The greater part was seated on the sclera, about $\frac{2}{5}$ of it on the cornea, in two lobes, one of which was deeply pigmented. The vision remained perfect. The treatment consisted in its extirpation, from which according to all appearances a radical cure resulted. The microscopical examination showed an exceedingly vascular connective tissue, containing a quantity of epithelial cells. Pigment was likewise found.

Thos. Reid: On Epithelioma of the Eye (*Glasgow Med. Journal*, vol. ii., 2, p. 147).

As this case was only mentioned cursorily and I have not said journal at command, there is nothing special to report about it.

A. Closson: A Case of Cancroid of the Cornea and Sclera (*Arch. f. Path. Anat.*, vol. l., p. 56).

After citing a series of cases the author reports one observed by himself, but remarks at the outset, in opposition to Berthold (*Arch. f. Opth.*, vol. xiv., 3, p. 149), who agrees with the opinion of Thiersch and Waldeyer, that he, for his part, could not accept these views, but, on the contrary, had arrived at different results as derived from his own observations. The patient, a herdsman, fifty-three years old, had noticed, so he stated, for some years a nodule, which, in the latter months, had increased in size, become painful, and had been in various ways removed by physicians and cauterized. The tumor then rapidly increased in size, while at the same time in the left side of the head severe pain had developed.

> Situated at the upper left corneal margin was a pale reddish growth with rough surfaces, of the size of a hazel-nut when the eyeball was removed. It extended 6 *mm* over the sclera, terminating in an abrupt border; towards the cornea it became gradually flatter and extended outwards over the centre of the pupil; height, 4 *mm*.

The following lengthy explanation of the result of the histological examination is intended to show that in the neighborhood of the blood-vessels the first, and, in fact, the larger, masses of tumor cells appeared. Closson then summarizes in the four following sentences the results arrived at:

1. The development of a carcinoma is preceded by a profuse development of blood-vessels in the neighboring tissues.

2. The development of the cancer cells is traceable to the blood-vessels.

3. The future of the cells depends essentially upon the conditions to which their surroundings expose them, and not, or at least not essentially, upon their origin.

4. The destructive effects of the carcinoma are based on the fact that the cells, through proliferation or distention, split the tissues apart, just as a skull may be burst open with soaked peas.

In conclusion the author seeks to bring further proof in favor of his assertions, in connection with which he offers many interesting remarks, to enter upon which, however, would overstep the limits of this paper.

Langhaus publishes a paper in *Virchow's Archives*, vol. xlix., p. 117, in which he endeavors to demonstrate that all pigment in melanotic tumors arises from metamorphosis of red blood corpuscles. He noticed distinctly that the pigment granules were always found enclosed in cells; that the numerous large pigment granules had the shape perfectly of the red corpuscles of human blood; they were disc-shaped, appearing round when looked at from in front, and rod-like from the side; in fact, even the central depression, or biscuit shape, could be recognized in many of the corpsucles which stood on edge.

The case of melanoma of the cornea reported in connection with the above-mentioned studies, was a fourth relapse, locally, in a man forty years old. It sat like a mushroom on the cornea, with a narrow base at the sclero-corneal margin, but did not extend beyond the corneal border, nor did it involve the ocular conjunctiva. The surface of the tumor was smooth, and of light-gray color. The lowest layers were deeply pigmented. The tumor had also invaded the tissue of the cornea, but more in the superficial than deep parts. As far as the growth had made progress the corneal corpuscles were more or less destroyed. As the author does not go further into details as to the results of the microscopical examination, we cannot be certain whether this case was one of a carcinoma or of a sarcoma.

Still other and numerous cases are reported in *Nagel's Jahr.-Ber.*, for instance, 1874, p. 314, by J. J. Chisholm, Ophthalmic and Aural Surgery Reports (*Richmond and Louisville Med. Journal*, Jan., 1873). This case was one of melanotic carcinoma, in the shape of three small, dark, round tumors at the limbus of the cornea, the largest of which was of the size of a millet-seed. As a relapse appeared an enucleation was performed. Nothing is mentioned as to the histological examination.

Id., p. 317. P. D. Keyser: Clinical Contributions to Ophthalmology (*Med. and Surg. Reporter*):

The patient, fifty-nine years old, had four years previously noticed the beginning of the larger tumor. Now there are two cancroids at the scleral border of the cornea. The larger tumor is 5 *mm* in width; the other is somewhat smaller; the color of both is reddish. Occasionally the patient suffers extreme pain; the vision is perfectly normal; an excision was performed. Six months later no relapse could be noticed.

Id., 1875, p. 241. W. Goldzieher: On a Case of Cancroid of the Cornea (*Pesther med.-chirurg. Presse*, No. 42, p. 658):

The present tumor developed in the patient (fifty-eight years old) within five years from a small wart. The growth juts out from the palpebral fissure like a mushroom, completely filling it and covering the entire cornea.

It is of a hard consistency, the surface uneven, and bleeds easily. After the enucleation Bowman's membrane was found to be completely intact. The result of the histological examination showed a tubular framework containing cells of an epithelial character.

Id., 1876, p. 278. Schiess describes a tumor of the conjunctiva and cornea (Basel, 12, *Jahresbericht*, p. 29). Proceeding from the cornea, connective-tissue septa of palisade-shape extended into the growth. Between these septa, which have a radiate arrangement, large epitheloid cells have grouped themselves. Schiess regarded the growth as partly carcinoma, partly sarcoma.

Manfredi: Contribuzione alla genesi dell' epitelioma della cornea (*Rivista clinica*, 1870, p. 35):

The disease affected the right eye of a man, fifty-three years old. According to the statement, a little nodule appeared on the outer side of the cornea, following a slight blow from the bough of a tree, which remained stationary for twelve years. Then, as within a few months it reached the size of a pea, it was removed.

Three months later there was already a relapse of half the size of a raspberry, whereupon an enucleation was performed.

The histological examination showed a mass of cells with nuclei and nucleoli, cylindrical epithelium, pavement epithelium, and prickle cells. The tumor was situated on the limbus conjunctivæ; its height was 5 *mm*, and breadth 8 *mm*. A section through the cornea, conjunctiva, and sclera showed cylindrical projections and vascular loops.

The growth consisted entirely of cells. The growth of the tumor had its origin from the corneal epithelium, whilst the conjunctiva was unchanged.

Van Münster reported a case in his inaugural dissertation: Contribution to the Knowledge of Precorneal and Conjunctival Melanotic Neoplasms:

When Mrs. F., forty years of age, was convalescing from typhoid fever she noticed at the outer margin of the cornea of the left eye a pale flesh-colored spot, which became gradually a somewhat elevated growth. It was smooth, shining, extending somewhat over the cornea, and occasioned no pain. From August, 1871, a rapid increase of growth took place, set up, so it was stated; by the irritation of a foreign body. From that time dated the commencement of a brown pigmentation. A slight lancinating pain also was felt.

In January, 1872, the patient came under treatment. There was an oval tumor, the lesser portion of which covered the sclera, while the greater projected over the cornea to the centre of the pupil. The centre was blackish-brown, the periphery pinkish, and the surface smooth. The vision was normal, but, on the other hand, the movement of the lid was somewhat restricted. The growth was extirpated. Five months later no relapse was apparent.

The diameters of the tumor are 1¼ and ¾ *cm*; the thickness, 2 *mm*. The epithelium of the cornea and conjunctive pass over it. In the tumor there are partly large round cells, partly polygonal cells, large nuclei and nucleoli; the protoplasm is darkly granular; many cells contain a quantity of pigment. The cells resemble epithelium. Narrow bands of fibrillated connective tissue are also visible.

In *Virchow's Archives*, 1870, vol. li., 515, Hirschberg describes a case of pre-corneal melano-carcinoma polyposum.

In the left eye of a peasant, fifty years old, a polypoid neoplasm made its appearance, having a dark color, projecting from between the lids, and bleeding easily. It was situated on the cornea, and had a broad base. At the corneo-scleral junction it sent roots into the tissue lying below it, but otherwise penetrated nowhere. The globe was intact. The tumor had at the base a length of 12 and a width of 10 *mm*. In front of the palpebral fissure it was 18 *mm* broad and 8 *mm* high. On the ocular conjunctiva there were two other black spots and a black point at the fold. The growth was extirpated; irregular polyhedral cells were especially numerous (round ones of flat shape). Besides other cell forms there was much pigment.

In the *Lancet* of July 13, 1872, is the following case of Julian Chisholm: Cancer of the Cornea Necessitating the Removal of an Eye in Which there was still Good Vision.

Mrs. B., forty-nine years of age, presented herself, in December, 1871, on account of a painful growth on the outer corneal margin of the left eye. It consisted of three parts, the middle and largest of which presented the size and appearance of a split pea; the others were of the size of a millet-seed.

A very similar growth had been extirpated and cauterized one year previously; six months after a relapse appeared, for which the same operation was performed. The operation is now performed for the third time. A good recovery followed, but already a few weeks later, a relapse appeared. After such unfavorable results of conservative procedure, an enucleation was performed. "A microscopic examination exhibited all the indications of malignancy, with cancer elements throughout the corneal parenchyma, upon which the tumor had established itself."

Henry D. Noyes, M.D., New York: A Case of Melanotic Epithelial Cancer on the Surface of the Eye; Extirpation of the Growth with Preservation of the Globe as well as of the Vision (ARCH. OF OPHTHALMOLOGY, vol. viii., p. 145, 1878). The observation was made in October, 1878.

Mr. W. S. O., forty-eight years old, first noticed on the outer side of the left eye a black spot, which hardly increased in size for twelve years. But within recent years, and especially in the last couple of months, a rapid increase took place.

The tumor was 10 *mm* long, 5½ *mm* wide, and 4 *mm* thick. It extended beyond the outer edge of the pupil; the sclero-corneal portion was a deep black, the corneal a dark brown. The surface of the tumor was ragged, moist, and of a doughy consistence. It lay close on the cornea. The vision remained normal, only somewhat distorted by the copious conjunctival secretion. The interior of the eye was also normal. The growth was extirpated, and the microscopic examination showed epithelial cells which were arranged concentrically.[1]

The author made the interesting statement that among 70,809 patients, who, in course of ten years, had been treated at the New York Eye and Ear Infirmary, only three cases of corneal tumor of a malignant nature had been observed, the best proof of the rarity of this disease.

At the conclusion of his article Noyes reported another case, which was observed in the Brooklyn Eye and Ear Hospital.

B. L., fifty-two years old, noticed a small red spot on the sclera near the cornea, which grew slowly until equal to one third the circumference of the cornea, ¼″ broad, 1‴ high. From this time on commenced a more rapid growth. The tumor was extirpated, after which the cornea was found intact. The result of the histological examination showed an epithelioma. As eight months thereafter a relapse took place, the globe was enucleated.

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[1] Dr. Noyes has been kind enough to send the following note on the further history of the case:

"The case of Mr. Ogden, with epibulbar tumor, was under my notice until February, 1883, that is about 4½ years. A deposit of pigment specks had taken place on the inner side of the cornea, making a very faint cloud; the bulbar conjunctiva below the cornea was blackened or of a brown color, over a considerable extent, but not so far as the cul de sac. One speck of pigment was upon the caruncle, and a little spot was on the inner surface of the upper lid near the ciliary edge. Besides increase of pigmentation of the conjunctiva and the minute pigment specks in the cornea, nothing abnormal had taken place. There was no thickening of tissue nor any tumor. The corneal locality from which the tumor was taken remained free." H. K.

Other cases to be added to these are found in the *Arch. für Ophth.* In vol. viii., 1, p. 314, is one reported by Heddæus: Melanotic Tumor on the Corneal Margin.

P. K., fifty-four years old, had on the right eye a black-brown mulberry-like tumor of the thickness of four peas, and of doughy consistency. It covered the outer third of the cornea and the same expanse of the sclera.

The tumor caused no pain, but was inclined to bleed very easily, and had been growing for three years. Vision remained intact. On extirpation of the growth it was seen to be easily separable from the sclera and cornea, and had become attached only in the region of the limbus corneæ and corpus ciliare for a space 6 *mm* long and 1 to 2 *mm* broad. After recovery a yellowish-brown coloration remained at this point.

Two years later the condition of the eye was seen to be still normal.

The microscope revealed epithelial cells with and without pigment, detritus, free pigment, and numerous large round cells, with large nuclei and nucleoli.

In vol. xiv., 3, p. 149, Berthold: Report of Cases of Carcinoma and Sarcoma Occurring at the Corneal Border.

The first case in which the diagnosis of carcinoma of the iris and cornea had been made, proved, on microscopic examination, to be a net-cell sarcoma.

The second case was that of a landed proprietor, fifty-five years old, who had at the outer scleral part of the right eye a tumor which invaded the cornea for 1½‴, and was of a bright-red color and very soft consistency. Its diameter was 4‴, and the height 1½‴. At the borders it could be partially lifted from the conjunctiva. It had been growing for eight months, but its development had been especially rapid during the last eight weeks. At the operation the growth was found to be so friable that the forceps pushed through, and it had to be removed with the scissors. The tumor was not grown to the cornea, but was glued to it so firmly that the epithelium of the anterior surface was torn away. The anatomical examination indicated carcinoma.

The third case occurred in a patient fifty-eight years old, who had on the right globe a mushroom growth half the size of a hazel-nut. It extended 2''' on the sclera, 1''' on the cornea, and adhered tightly everywhere. The upper surface was whitish, sprinkled with red. The lids could be conveniently closed.

A year before, the patient experienced some pressure at this point; eight weeks before, the tumor was as large as a pin-head, and had since then grown rapidly, but without pain.

The microscopical appearance of this tumor was the same as that of the previous one. A relapse appeared almost immediately at the old spot, and besides this, about 2''' farther to the outer side, still another and a third nodule, all of which grew rapidly and, histologically, presented the same appearance.

The author then specifies some points as to making the differential diagnosis between carcinoma and sarcoma.

1. The connection of carcinoma with the cornea is more intimate, on account of the more considerable thickness of the epithelial layer. The membrane of Bowman remains long intact in both.

2. The borders of the sarcoma rise abruptly from the cornea and sclera. As the carcinoma is seated like a mushroom on the cornea and sclera, the elevation of the borders is gradual.

3. The tissue of the carcinoma is extraordinarily soft and friable; that of sarcoma is of a firmer consistency.

It appears to us, however, that these points cannot be regarded as generally to be depended upon, so that the diagnosis can be established by them with certainty; in the cases mentioned the authors often enough reported opposite experience. In conclusion he cites the views of Thiersch, Waldeyer, and others: Carcinoma develops through proliferation of epithelium, with increase of the connective tissue through stimulation thereof. The epithelium does not necessarily originate in glandular substance, but can also develop from the external integument.

Id., vol. xvii., 2, p. 204. Manz: A Melanotic Tumor of the Cornea:

Mrs. G., sixty-five years old, presented herself in December, 1869, with a tumor of the left eye. Her statements were unsatisfactory. She could only say as to the commencement, that the trouble began, two years before, as a streak which extended towards the pupil. The patient saw well up to six months ago. For two months a more rapid growth had been noticed, and now and then hemorrhage had taken place. There was seldom pain, which was confined to the left frontal region. The tumor jutted beyond the palpebral fissure, and was half the size of a nut, 23 *mm* wide. It consisted of four nodules of a grayish-black color and had an uneven, ulcerated surface. The cornea was overlapped on all sides, but they were sharply separated from it. The borders of the tumor could be easily raised. There was smooth healing after enucleation, and up to October, 1870, there had been no relapse.

Microscopical appearance: Between columns of large, wide, spindle cells, spread out like a tree, and containing oval nuclei, are heaped up epithelial nuclei and nucleoli. Other cells were also present which were round, smaller, and contained two to six nuclei. An abundance of blood-vessels; irregular distribution of pigment.

A similar growth, likewise a melanotic tumor, was seen in a man forty-six years old. It was only stated of this tumor that it was located at the corneal margin, reappeared two years after its extirpation, and within eight weeks had grown so rapidly as to cover the upper third of the cornea. After being again removed recovery ensued.

Schneider, in vol. xxii., 3, p. 209, furnishes a contribution to the therapeutics of epithelioma on the sclero-corneal junction.

The right eye of D., a working woman, sixty-eight years old, was inflamed, in May, 1875, to a high degree. Day and night she had severe pains in the entire right side of the head. When she presented herself there was a pear-shaped tumor, the larger portion of which was situated on the sclera, the smaller on the cornea. The greatest diameters were 9 and 7 *mm.* The surface of the tumor was fissured, warty, and grayish-white in color, the consistency hard and dense. It was not movable over the subjacent parts. The tumor was said to have been the result of a trauma. It began as a small red nodule and caused no annoyance. The diagnosis of epithelioma was made and confirmed through the demonstration of cancroid nests and cones. The treatment consisted in the removal of the tumor; a relapse followed, but after a second removal a cure resulted.

In *von Graefe's Arch. f. Ophth.*, vol. vii., 2, p. 9, there is an article by the editor: Cases of Tumor—Two Cases of Cancroid on the Surface of the Globe.

The first case was that of an officer of middle age, who had been treated by an oculist for a particularly obstinate phlyctenular ophthalmia. A later examination showed a fascicular injection stretching from the periphery to the outer margin of the cornea, at which place there was a swelling 1 line in extent; the height was ½'''. The borders were steep; the surface, looked at with a lens, irregular, somewhat papillary, not ulcerated, and completely dry.

After removal, healing followed in a few days. The above-mentioned injection disappeared at the same time. The examination by Virchow showed the scant connective tissue penetrated in its entire thickness by closely packed epithelial cones. A year later there was no relapse.

The other case was that of a woman, fifty-seven years old. Two years before, she noticed a redness at the outer angle of the right eye, which slowly approached the corneal border and produced a swelling there. Six months later the case came for examination. There was a flat growth which covered over one fourth of the cornea, was ¾''' high, and had sharp, almost perpendicular borders. It hardly extended over the sclera, but continued as a part of the conjunctiva permeated with veins. The color was brownish-gray.

In removing the tumor it was seen to be in intimate connection with the cornea for a space of 1''' square, but otherwise lay loose upon it. The conjunctival injection disappeared, and a week and a half later the eye again presented a good appearance. This growth was also examined by Virchow and pronounced cancroid. Before the end of a year a relapse appeared.

In *v. Graefe's Arch.*, vol. viii., Althoff describes a case of cancroid of the ocular conjunctiva in a man, which covered almost the entire cornea. He stated that 3½ years before, after taking a cold, he noticed a nodule at the outer border of the cornea. After enucleation of the eye the growth was examined. It was 4 *mm* in height, 19½ *mm* long, and 14½ *mm* broad. The surface was fissured, of a cauliflower nature, and dirty-gray color. The surface of the section presented a dendritical appearance, like an arbor vitæ. Excepting a place (1 *mm* square in extent) where it was united with the substantia propria to its centre, it could be easily pulled off. The cornea was thinned, but the individual layers were normal. The histological examination showed a firm fibrous framework, large blood-vessels, cells of all shapes, large, round or sharp-cornered, club- or spindle-shaped, with one or more nuclei, and often full of fat granules. The cells lay, heaped up in clumps, on the fibres of the network. The neighboring mucous membrane had to be in part removed with it. As it was greatly involved, the danger of recurrence of the disease was so much the greater. The interior of the eye was normal. Seven months later there was no sign of a relapse.

Schmid : Contribution to the Knowledge of Corneal Tumors (*Graefe's Arch.*, vol. xviii., 2, p. 120).

The author mentions four cases; in the three last, however, he only gives the result of examination of the tumors. Of the first case we get also, briefly, the clinical history.

In the first case (that of a Russian peasant) there was a large growth on the left eye, which projected beyond the lids and partly overlapped the latter in its growth. It is ragged, lobulated, of a dark-brown color, and bleeds easily. According to his statements the cause was an injury received a few months previously.

The anterior segment of the globe was removed with the tumor, but as a new growth appeared in the same year, enucleation was performed. The base of the tumor was 12 *mm* broad, of which 4 or 5 *mm* belonged to the cornea.

Histological examination: In the neighborhood of the tumor, granulation tissue had proliferated into the sclera and substantia propria of the cornea. The growth itself possessed a compact fibrous, arborescently ramifying stroma, rich in blood-vessels. Besides the small cells of the granulation tissue, there were large round ones, with two or more nuclei, belonging to the tumor mass. Besides these, there was pavement epithelium, partly in rows, partly in heaps, which contained a black to light-brown pigment. The second tumor showed exactly the same conditions as the preceding, only that the nucleated round cells predominated over the granulative and epithelial cells. Here also, however, the diagnosis of "carcimona melanodes" was made. The third tumor also showed granulation tissue. An epithelial layer spread out over the the entire periphery of the tumor; at the same time the epithelial layer of the cornea had increased. At the angle where the tumor was seated on the cornea, a large epithelial offset penetrated horizontally into the growth.

This offset showed a covering of cylindrical epithelium in the centre ; on the contrary there was pavement epithelium. In addition to this, great quantities of large pavement epithelial cells were found in the growth. The surface showed an uninterrupted stratum of epithelial cells 2 *mm* thick. The anterior elastic lamina could be followed almost to the sclera. The substantia propria and the lamina elastica posterior were normal. The diagnosis was likewise melanotic carcinoma.

The fourth case was one of a pigmented, lobulated tumor, which rested for the greater part on the sclera. On the scleral side the tumor rose abruptly. There had been proliferation of epithelium on the cornea. The lamina elastica anterior could be traced to a point, where an epithelial cone of round and epithelial cells had penetrated into the substantia propria itself. The surface of the growth consisted entirely of pavement epithelium. The lamina elastica posterior was not affected.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE FIRST AND SECOND QUARTERS OF THE YEAR 1888.

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WITH THE CO-OPERATION OF

S. M. Burnett, Washington . Dantone, Rome ; Hirschmann, Charkow ;
E. Marckwort, Antwerp ; P. v. Mittelstädt, Metz ; Werner,
Dublin ; C. H. A. Westhoff ; Amsterdam ; Schiötz
and Ole Bull, Christiania, etc.

Sections I.–V. Reviewed by Prof. H. MAGNUS.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

1. Galezowski. Traité des maladies des yeux. Paris, 1888. 3d ed., 1008 pages with 483 illustrations.

2. Hint. Pathology and therapeutics of nervous diseases. First half. Vienna and Leipzig, 1888. The second chapter contains a brief description of the diseases of the optic nerve, and the third chapter a presentation of the diseases of the nerves supplying the muscles of the eye. The anatomical illustrations are worthy of notice and valuable to the oculist.

3. Jessop, Walter. Abstracts of lectures on the physiological and pathological conditions of the pupil and accommodation. Lecture I. On the pupil. *Ophth. Rev.*, 1888, p. 161.

4. Jacob. On simulated diseases of the eye. *Inaug. Diss.*,

Kiel, 1888. The author gives a brief description and criticism of the methods devised for detecting simulated diseases of the eye. It is well adapted for practical purposes.

5. SCHMEICHLER. Contribution to the ocular defects of soldiers. *Der Militärarzt*, 1888, Nos. 4–7.

SCHMEICHLER (5) discusses the optical defects which play an important part in recruiting, and is unreservedly opposed to the wearing of glasses by soldiers.

STATISTIQUE DES AVEUGLES EN RUSSIE EN 1886. St. Petersburg, 1888. These statistics are of the greatest importance ; they show that such an examination of all the blind in the Empire can be carried out.

b.—STATISTICAL PAPERS.

6. NINETEENTH ANNUAL REPORT OF THE BROOKLYN EYE AND EAR HOSPITAL FOR THE YEAR 1887. Surgeons—Drs. Matthewson, Prout, and Rushmore.

7. J. J. CHISOLM. Tenth Annual Report of the Presbyterian Eye, Ear, and Throat Charity Hospital of Baltimore for 1887.

8. FARAVELLI e GAZZANIGA. Considerazioni sulle cause della cecità e sulla geografia del tracoma nella Provincia di Pavia. *Ann. di Ottalm.*, vol. xvii., 1, p. 11.

9. FIEUZAL. Compte rendu statistique pour l'année 1887. Compte rendu de la clinique, coup d'œil rétrospectif. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts*, vol. vi., No. 1.

10. JUST. Thirteenth Annual Report of the Ophthalmic Institute at Zittau for the Years 1886 and 1887. Zittau, 1888.

11. MAGNUS. Report on the ophthalmic clinic of Prof. Magnus from April 1, 1887, to April 1, 1888. Breslau, 1888.

12. SECOND ANNUAL REPORT OF THE MAINE EYE AND EAR INFIRMARY, Portland, Me., 1887. E. E. Holt, Surgeon.

13. MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY. Sixty-second report, for the year 1887.

14. EIGHTH ANNUAL REPORT OF THE NEWARK CHARITABLE EYE AND EAR INFIRMARY FOR 1887. Drs. Kipp and Rankin.

15. TWENTY-SECOND ANNUAL REPORT OF THE ST. MICHAEL'S HOSPITAL OF NEWARK, N. J.—OPHTHALMOLOGICAL DEPARTMENTS FOR 1887. Dr. T. Y. Sutphen.

16. NEW YORK OPHTHALMIC AND AURAL INSTITUTE. Eigh-

teenth annual report, for the year beginning Oct. 1, 1886, and ending Sept. 30, 1887. New York, 1887.

17. ST. PETERSBURG. Report on the St. Petersburg ophthalmic clinic. No. 2, St. Petersburg, 1888.

18. SCHREIBER. Fifth annual report on Dr. Schreiber's ophthalmic clinic at Magdeburg for the year 1887. Magdeburg, 1888.

19. THIRD AND FOURTH BIENNIAL REPORTS OF THE EYE AND EAR CLINIC AT THE CENTRAL DISPENSARY OF WASHINGTON, D. C. Swan M. Burnett, Director. Including a bibliography of the publications of the Director. 1888.

20. WILLS EYE HOSPITAL OF PHILADELPHIA. Report for the year 1887.

During 1887 there were treated in the BROOKLYN EYE AND EAR INFIRMARY (6) 4,443 eye patients. Catract extractions, 11—Graefe's, and one flap downward without iridectomy.

BURNETT.

Number of eye cases treated at the Presbyterian Eye, Ear, and Throat Hospital of Baltimore during 1887, 4,681 (7). Operations, including the minor ones, 927, of which 83 were extractions of cataract. BURNETT.

FARAVELLI and GAZZANIGA (8) report on the ophthalmic department and dispensary of the hospital at Pavia from 1884 to 1887 (2,853 patients), and present on two tables the causes of blindness of 193 persons blind in one eye and 53 blind in both. A third table shows the geographical distribution of trachoma in the province of Pavia; it comprises almost 11% of the remaining eye diseases, but is the cause of blindness in only 1.03% of the cases of monocular and in 1.88% of binocular blindness.

DANTONE.

FIEUZAL (9) treated, from 1872 to 1880, in all 27,723, and from 1880 to 1887, inclusive, 60,242 eye-patients. In 1887 10,190 patients were treated. Number of extractions, 518—77.22% with good, 20.07% with moderate results, 2.71% failures.

JUST (10) treated 3,123 eye patients in 1886, and 3,086 in 1887. He operated 131 uncomplicated cataracts, 128 of them with good results. One eye suppurated. In 2 cases severe iritis ensued. Simple linear extraction was performed in 7 cases; linear extraction in 2; extraction with low frontal flap in 99 cases; the same operation after artificial ripening in 26; the same without opening the capsule in 7.

MAGNUS (11) treated 3,291 new patients. He also presents a review of the eye affections which can be ascribed to constitutional diseases (12.82 %), and of the heredity of myopia. In 37.5 % of all cases of myopia heredity could be assumed.

In the MAINE EYE AND EAR INFIRMARY (12) there were treated in 1887 788 eye patients, and 246 operations were performed (including the minor ones), and of these there were 21 extractions with iridectomy and 4 without, and 3 by suction. One eye was lost. BURNETT.

The number of eye patients in the MASSACHUSETTS EYE AND EAR INFIRMARY (13) during 1887 was 10,085. Among the operations there are reported: 82 extractions of cataract (Graefe), 20 without iridectomy and 9 by the suction method, all systematically arranged by Dr. H. Derby. There was loss of two eyes in those extracted with iridectomy. The length of treatment in those treated antiseptically was 14.8 days; for the others, 22 days. BURNETT.

In the NEWARK EYE AND EAR INFIRMARY (14) there were treated during 1887 2,741 eye cases. Extractions according to Graefe, 11; 5 extractions without iridectomy. BURNETT.

In the OPHTHALMOLOGICAL DEPARTMENT OF ST. MICHAEL'S HOSPITAL (15) there were treated 1,413 eye cases. There were 149 operations, embracing minor ones, of which 7 were extractions after v. Graefe. BURNETT.

In the NEW YORK OPHTHALMIC AND AURAL INSTITUTE (16) 5,141 eye patients were treated. Extraction without iridectomy was performed in 64 cases, in 61 with good, 2 with moderate result, 1 failure. Extraction according to Graefe was performed in 10 cases with good results. BURNETT.

In ST. PETERSBURG (17) 7,984 eye patients were treated from 1879 to 1883. Number of cataracts operated, 595,—533 with good, 12 insufficient result, 50 failures.

SCHREIBER (18) treated 1,900 new patients. Extractions according to v. Graefe, 19, among which 2 failures. The lachrymal sac was removed in 28 cases; 13 exenterations. In 22 cases corneal ulcers were cauterized, in 18 successfully, in 4 not.

In BURNETT'S clinic (19) 2,310 eye patients were treated. Number of operations, 328 (including the minor), among them 12 cataract extractions. Nearly all the major operations were done at the Garfield Hospital and are not included in this report.

There were treated in the WILLS HOSPITAL (20) during 1887 8,737 eye patients. There were 1,427 operations, counting the minor ones, and among them were 82 extractions. BURNETT.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

a.—GENERAL PATHOLOGY.

21. FRIEDENWALD. The visible currrent of blood in newly formed corneal blood-vessels. *Centralbl. f. prakt. Augenhk.*, Feb., 1888.

22. GALLENGA. Del rapporto fra panoftalmite e microorganismi piogeni. *Rassegna di sci. med.*, vol. iii., 2.

FRIEDENWALD (21) found that in newly formed corneal blood-vessels the current of blood is divided into small sections; he found red columns separated by colorless intervals. These columns sometimes moved irregularly, sometimes steadily.

GALLENGA (22) prepared gelatine cultures with the exudations of ten eyes in a state of panophthalmitis, in some of which enucleation had been performed, in others exenteration, and obtained the following results. In all of the cultures he found the staphylococcus pyogenes albus, 9 in the staphylococcus aureus, 3 in the staphylococcus citreus, 3 in streptococcus pyogenes, and in one a colony of bacilli which resembled those of Passet. In the tissues he found the beginnings of micrococci, but the individual forms could not be distinguished. In three of the diseased eyes there was blennorrhœa of the lachrymal sac. DANTONE.

b.—GENERAL THERAPEUTICS.

23. MOTAIS. Des incisions sur l'équateur et l'hémisphère postérieure du globe. Considérations anatomiques et nouveau procédé opératoire. *Congr. d'ophth.* de Paris, 1888.

23A. STADERINI. Iniezione di calomelano alla tempia; conseguente embolia dell'arteria temporale superficiale e gangrena locale. *Boll. d. Soc. tra i calori delli Sci. med.*, vol. v., 6.

MOTAIS (23) gives accurate directions for choosing the point of incision in ophthalmotomy. Especial care must be taken to avoid the oblique muscles, the ciliary nerves and arteries, and the ciliary body. The area within a radius of 5–6 *mm* around the optic nerve must be avoided on account of the ciliary arteries, also the region within 5–6 *mm* of the cornea on account of the ciliary body. MARCKWORT.

c.—GENERAL DIAGNOSIS.

24. CHONET. De la skiascopie (ancienne kératoscopie). Théorie et application. *Rec. d'ophth.*, 1888, No. 4.

25. Claiborne, Herbert. Hyperphoria. *N. Y. Med. Journ.*, March, 1888.

Claiborne (25) thinks the manner of designating hyperphoria introduced by Stevens deficient in exactness. He thinks the deviation should be designated by the muscle (superior or inferior rectus) that is at fault, whether it be too strong or too weak as compared with those of the other eye. When the deviation is upward it is called vicious hyperphoria. Attention is also called to the fact that in many persons the eyes do not lie in the same horizontal plane, and the influence of this condition in the production of hyper- and hypophoria. Burnett.

26. Straub. A solution of fluorescine as a diagnostic aid in affections of the cornea. *Centralbl. f. prakt. Augenhk.*, March, 1888.

The author calls attention to the fact that the uninjured cornea does not absorb fluorescine, but does so when the epithelium is gone. This fact he utilizes to determine the regeneration of the epithelium, as well as for the diagnosis of loss of epithelium in general.

III.—INSTRUMENTS AND REMEDIES.

a.—INSTRUMENTS AND TECHNICAL CONTRIVANCES.

27. Burnett, S. M. A modification of the refraction ophthalmoscope with an attachment for using cylindrical glasses. *Trans. Amer. Ophth. Soc.*, 1887.

28. Doyne, R. W. A new stereoscope. *Ophth. Rev.*, 1888, p. 65. Intended for the orthopædic treatment of strabismus.

29. Gillet de Grandmont. Périoptométrie et chromatopsie. Périmètre et chromatoptomètre. *Arch. d'ophth.*, vol. viii., No. 3, 1888.

30. Kroll. Stereoscopic pictures. 2d ed. Hamburg and Leipzig, 1888. The favorable criticism passed upon the first edition of these pictures was justified by the speedy appearance of a second edition.

31. Leroy and Dubois. Un nouvel ophthalmomètre pratique. *Rev. génér. d'ophth.*, 1888, No. 2.

32. Risley, S. D. A modified form of ophthalmoscope, with cylinders. *Trans. Amer. Ophth. Soc.*, 1887.

33. Stephenson, Sydney. Wolfberg's color-test. *Brit. Med. Journ.*, May, 1888, p. 1111.

34. Wilmer, W. H. Levelled abducting prisms. *N. Y. Med. Rec.*, March 17, 1888.

Burnett's (27) modification consists in the addition of a clip behind the disc containing the lenses, into which the cylinders from the trial case can be put when needed. He also has a plane circular mirror, and swung in front of this, a tilting concave mirror. When it is desired to use the plane mirror alone, the tilting mirror can be detached from the upper bearing and fastened out of the way below. The discs give 25 minus and 22 plus spherical lenses. Burnett.

In order to make a rapid and accurate determination of the field of vision possible, Gillet de Grandmont (29) has improved the self-registering perimeter which he designed in 1881, and with the aid of two illustrations presents an accurate description of it, which cannot be condensed into a few words. Four objects move simultaneously along the four arms of the perimeter set at right angles to one another and movable about a common axis ; the patient must then say where he sees the objects, above, to the right, etc., thus preventing the eye more readily from leaving the point of fixation. To determine the margin of the color-field, four different colors are placed upon the four branches of the perimeter without the knowledge of the patient, and moved simultaneously towards the point of fixation until all the colors are correctly named. The point in question can easily be verified by repetition. He expresses the extent of the visual field in four meridians with the aid of a number of four digits, the individual numbers of which correspond each time to a certain meridian, and, by leaving off the 0°, indicate the angle, thereby making the differences among the visual fields readily apparent. For details see the original. Central color-perception the author tests with the chromatoptomètre, which he also illustrates and describes, in which he presents color-squares 2 *cm* square to the eye in a downward direction, the size of the square being decreased with the aid of a slide until the limit of perception is reached. He illustrates with the aid of normal color-fields and gives tables of the normal power of central color-perception. It is worthy of note that the author did not find any increase in the extent of the visual field when he eliminated the effect of the nose, brow, etc., by altering the position of the head, a fact which he explains by assuming that the corresponding parts of the retina are not sufficiently trained. Mittelstädt.

LEROY and DUBOIS (31) have constructed a new ophthalmomètre, partly after that of Hehnholtz, partly after that of Javal-Schiötz. It is said to possess the advantage over that of Javal-Schiötz of being cheaper, more accurate, easily handled, and adapted to every kind of illumination. MARCKWORT.

RISLEY'S (32) modification consists in placing cylinders in the slides in the handle of the instrument after the manner of Jackson, to be used in connection with the spherical lenses in the ordinary disc. BURNETT.

STEPHENSON (33) has tried Wolfberg's method of determining refraction in numerous cases, but could not confirm the results obtained by the latter, and therefore criticises the whole method unfavorably. The *Brit. Med. Jour.* accordingly condemns the method, basing its judgment on the results of Stephenson and Herzog.

WILMER (34) places a small spirit-level above the nose-piece of an ordinary spectacle-frame holding prisms with their bases inward, in order to determine whether the prisms are perfectly horizontal. BURNETT.

b.—REMEDIES.

35. NICOLAI. Het weetkzame bestanddeel der Jequirity-Zoder. Feestbundel Donders Jubiléum, Amsterdam, 1888. The dependence on micro-organisms in the jequirity infusion for its efficacy as was ascribed by Sattler, has been proved erroneous by Hippel. The paper of NICOLAI (35) confirms this, showing that the action of jequirity is chemical and not dependent upon the presence of micro-organisms. He found that the bacilli do not produce conjunctivitis, have no effect upon the development of the active principle, and are incapable of killing frogs. He obtained from the seeds a chemical substance acting like a ferment, a so-called enzyma, by treating the seeds with phosphoric acid, neutralizing with lime-water, and purifying with a solution of cholesterine in alcohol and ether. He thus obtained a white amorphous substance, which had the power of producing conjunctivitis, lost it in contact with borax, but not in contact with ether, chloroform, phosphoric acid, boracic acid (3 %), hydrochloric acid and sublimate 1: 10,000, which does not act as diastase, pepsine, or rennet ferment, and is a powerful poison when brought into the blood. WESTHOFF.

36. PURTSCHER. The application of creoline in ophthalmol-

ogy. *Centralbl. f. prakt. Augenhk.*, March, 1888. A 1 % solution of creoline possesses powerful antiseptic properties, and does not produce any lengthy irritation.

37. SCHIESS. The use and abuse of collyria. *Correspondenzbl. f. Schweizer Aerzte*, vol. xviii.

38. STADERINI. Le injezioni ipodermiche di pilocarpina nella terapia oculare. *Morgagni*, vol. xxx., 1888.

The following reviews refer to anæsthetics, the first of which is

Erythrophleïne.

39. ALT, A. The new local anæsthetic—hydrochlorate of erythrophleïne. *Amer. Journ. of Ophth.*, Feb., 1888.

40. BERNHEIMER. Contribution to the knowledge of the anæsthetic effect of muriate of erythrophleïne. *Klin. Monatsbl. f. Augenhk.*, March, 1888.

41. GASPER. L'érythrophléine. *Progr. méd.*, 1888, p. 139.

42. GOLDSCHMIDT. Erythrophleïne as an anæsthetic. *Centralbl. f. klin. Med.*, 1888, p. 121.

43. HIRSCHBERG. Erythrophleinum hydrochloricum. *Centralbl. f. prakt. Augenhk.*, Feb., 1888.

44. KAPOSI. Erythrophleïne, the new anæsthetic. *Wiener med. Wochenschr.*, 1888, No. 9.

45. KAREWSKI. Erythrophleïne. *Deutsche med. Wochenschr.*, 1888, p. 143.

46. KAZAUROW. The action of the muriate of erythrophleïne on the normal eye. *Wratsch*, 1888, No. 9.

47. KOLLER. Erythrophleïne. *Wiener med. Wochenschr.*, 1888, No. 6.

48. KÖNIGSTEIN. Experiments with erythrophleïne. *Internat. klin. Rundschau*, 1888, No. 8.

49. LEWIN. On a local anæsthetic. On the Hoya poison. *Deutsche medicinal-Zeitung*, 1888, No. 6.

50. LIEBREICH. On the action of the N'Cassar bark and erythrophleïne. *Deutsche med. Wochenschr.*, 1888, No. 7.

51. PANAS. Sur la valeur de l'érythrophléine en ophthalmologie. *Arch. d'ophth.*, vol. viii., 2, 1888.

52. v. REUSS. The action of erythrophleïne on the human eye. *Internat. klin. Rundschau*, 1888, No. 8.

53. SCHMIDT–RIMPLER. Anæsthesia of the eye produced with muriate of erythrophleïne. *Berlin. klin. Wochenschr.*, 1888, No. 14.

54. TROUSSEAU. L'érythrofleïne. *Bull. de la clin. nat. ophth. del' hosp. des quinze-vingts*, vol. vi., 1, 1888.

55. TWEEDY. Erythrophleïne. *The Lancet*, Feb. 4, 1888.

56. VENTMINI e GASPORINI. Sugli effetti anestetici delle elleboreina. *Bull. d'ocul.*, vol. x., Nos. 6 and 7.

57. WELCKER. Experiments with muriate of erythrophleïne. *Centralbl. f. prakt. Augenhk.*, Feb., 1888.

The results obtained by the authors named above in regard to erythrophleïne agree with those first reported by LEWIN (49). The latter found that a 0.2 % solution instilled into the eyes of rabbits and cats produces an anæsthesia after 15–20 minutes which lasts a day to a day and a half. Even solutions of 0.1 and 0.05 % produce this result. Concentrated solutions produce symptoms of severe irritation and intense opacity of the cornea. KOLLER (47) tried the remedy upon himself with a 0.125 % solution, and found that this solution also greatly irritated his eye. The anæsthesia lasted a long time, but the eye was very painful at first, and the cornea became so dull that for two days he could not read with that eye. HIRSCHBERG (43), SCHMIDT–RIMPLER (53), BERNHEIMER (40), and others had similar results with patients. TWEEDY (55) alone had negative results, but as he is the only one, they were probably due to errors. All authors agree that erythrophleïne is inferior to cocaine, and therefore will not hold a lasting position in ophthalmology.

Cocaine.

58. TARTUFERI. Sul cloromercurato di cocaina e sul suo potere antisettico. *Ann. di ottalm.*, vol. xvi., 5, 6.

59. TSCHERNOMORDIK. The question of the effect of muriate of cocaine on the cornea. *Russkaya med.*, 1888, No. 5. Refutation of the assertion of Dr. Wadsinsky, that cocaine does not act upon the cornea.

60. WICHERKIEWICZ. The application of cocaine in ophthalmic surgery. *Allg. Wiener med. Ztg.*, 1888, No. 1, and *Pozeglad Lekarsky*, 1888, Nos. 47 and 48.

TARTUFERI (58) shows that in the formula given by Sattler—cocain. hydrochlor. 5.0, hydrarg. bichlor. corr. 0.02, aq. destill.

100.0, to obtain a collyrium which is both an antiseptic and an anæsthetic—the corrosive sublimate combines with a part of the cocaine and forms a new salt (sublimate-cocaine, $C_{17}H_{22}NO_4$-$ClHgCl_2$), which possesses scarcely any antiseptic properties, as attempts at sterilization with it have shown. DANTONE.

WICHERKIEWICZ (60) has not observed any more the corneal affection described by Bunge, since he instils the cocaine (5 %) only once or twice just before the operation. He recommends subconjunctival injections of cocaine, 3–5 %, in a weak solution of sublimate (1 : 10,000). In the removal of subconjunctival growths or orbital neoplasms the solution is injected into the orbital tissue or into the tumor itself ; in enucleation of the eyeball it is best to inject in the direction of the four recti muscles ; in operations on the lids, under the skin of the latter. The quantity injected never exceeded 1½ syringefuls. Symptoms of intoxication were rarely observed. HIRSCHMANN.

IV.—ANATOMY.

a.—GENERAL ANATOMY.

61. HERRNHEISER. On congenital microphthalmus. *Prager med. Wochenschr.*, 1888, No. 12.

62. SALTINI. Contribuzione clinica allo studio delle anomalie congenite dell' occhio. *Boll. d'ocul.*, vol. x., Nos. 10 and 11.

63. VALUDE et VASSAUX. Note sur l'œil d'un cyclope. *Arch. d'ophth.*, 1888, vol. viii., No. 1.

HERRNHEISER (61) describes 6 cases of congenital microphthalmus. The description contains nothing new.

SALTINI (62) describes, among other congenital ocular defects, a diffuse corneal opacity in both eyes, which he observed in three brothers and sisters, and which he considers the remnant of an interstitial intra-uterine keratitis ; also a case of congenital uniocular microphthalmus with shrunken cataract and marked prolongation of the ciliary processes, and limitation of mobility inward.

The cyclopian eye examined by VALUDE and VASSAUX (63) consisted of a single spherical sclera, a double dumb-bell-shaped cornea, two irides, and two lenses. From this the authors conclude that the ectoderma forming the lens and that part of the mesoderma forming the uveal tract are differentiated at an earlier date than that part which forms the sclera. On the lids, which were essentially normal, there was only one lachrymal canal which did not reach the lachrymal sac, which seems to the authors to confirm the hypothesis of Kölliker, that the beginning and end of the lachrymal canal develop separately. The canal therefore develops from the conjunctiva. (The posterior portion of the eye, with the optic nerve, had been left in the orbit.)

v. MITTELSTÄDT.

b.—RETINA.

64. FALCHI. Sull' istogenesi della retina e del nervo ottico. *Ann. di ottalm.*, vol. xvi., Nos. 5 and 6.

65. RAMPOLDI. Sulla fina anatomia dell' interno limite della retina dei mammiferi. Nota preventiva. *Ann. di ottalm.*, vol. xvii., 1.

66. TARTUFERI. Sulla istologia della retina. *Ann. di ottalm.*, vol. xvi., Nos. 5 and 6.

FALCHI (64) describes the results of his investigations of the histological development of the retina and optic nerve in the embryo of mammals.

RAMPOLDI (65), in a preliminary notice, reports on a nerve-plexus discovered by him at the very limit of the retina. It lies between the retina and vitreous and has the appearance of a very delicate membrane.

DANTONE.

TARTUFERI (66) reports his latest microscopical investigations of the retinal elements, after he had succeeded in coloring the retina black according to Golgi's method (combined action of bichromate of potassium and nitrate of silver).

V.—PHYSIOLOGY.

a.—GENERAL PHYSIOLOGY.

67. MAYER. The position of the book in writing. *Friedreich's Bl. f. gerichtl. Med.*, 1888, No. 2.

68. TSCHERNING. Bidrag til det menneskelige Dioptrik. *Nord.-ophth. Tidsskrift*, 1, 2, 1888.

MAYER (67) has arrived at the following results: Writing is accomplished by the combined action of the right upper extremity and the eyes. Both factors, however, are not subject to rigid laws, but the range within which writing can be accomplished is very extensive. That of the eyes is larger than that of the arm and hand, and the former will therefore more commonly adapt themselves to the latter than vice versa. The best method of writing, from a theoretical point of view, is that in which the eyes and hand work together in such a manner that neither over-exertion of the former nor a bad position of the body will easily result. The sooner the latter event takes place, the poorer the method of writing. Of the various methods, the upright position of the writing, with the book placed directly in front, satisfies all the demands of the eye and hand. Slanting writing is best when the book is inclined, making an angle of 30°–40° opening to the right. A greater angle is injurious to the carriage of the body ; a smaller one soon causes the book to be pushed to the right ; otherwise the writing cannot be slanted sufficiently. For the eyes and the carriage of the body the inclined position is not as good as the horizontal. Placing the book to the right has generally been condemned as injurious both to the eyes and to the carriage of the body. The favor which they enjoy must be ascribed to the freedom which they give to the hand.

TSCHERNING (68) remarks as follows on the oblique position of the lens in its relation to the lines of sight : the lines of sight are never perpendicular to the surface of the lens. In the eyes which he examined the lens was always turned outward in its relation to the line of vision (3°–7°). He also found, as a rule, that the lens had been turned about its horizontal axis, so that the upper edge was tilted forward (less frequently backward) ; this torsion sometimes amounted to 3° and more. This obliquity of the lens causes a myopia which may reach 0.5 D and 0.25 D of astigmatism, the horizontal meridian possessing the greater curvature.

b.—COLOR-PERCEPTION.

69. ARMSTRONG. Color-blindness in the mercantile marine of the United States. *Brit. Med. Jour.*, Jan. 28, 1888.

ARMSTRONG (69) reports that 2.3 per cent. color-blind were found in the United States mercantile marine with Holmgren's tests.

Sections VI.–XI. Reviewed by DR. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

70. COHN, H. Remarks on school-hygiene in Constantinople. *Zeitschr. f. Schulgesundheitspflege*, 1888.

71. CUIGNET. Des règles à suivre pour le choix des verres

correcteurs des amétropies. *Rec. d'oph.*, 1888, No. 2, p. 65. Nothing new.

72. GALLENGA. Dimonstrazione practica dell'azione secondaria delle lenti convesse. *Rassegna di sci. med.*, vol. iii., 6.

73. GREEN, JOHN. On a transient myopia occurring in connection with iritis. *Trans. Amer. Ophth. Soc.*, 1887.

74. HARPER, JOHN E. The causative connection of ametropia to ocular diseases. *Jour. Amer. Med. Ass'n*, Jan. 14, 1888.

75. HOSCH. Uniocular paresis of accommodation with mydriasis in inveterate syphilis. *Correspondenzbl. f. Schweizer Aerzte*, 1888, No. 4.

76. MARTIN, G. Migraine et astigmatisme. *Ann. d'ocul.*, vol. xcix., pp. 24 and 105.

77. RISLEY, S. D. Hypermetropic refraction passing into myopia while under observation. *Trans. Amer. Ophth. Soc.*, 1887.

78. SALTINI. Sulla myopia nelle scuole di Parma. *Ann. di ottalm.*, vol. xvi., 5–6, p. 471.

79. SCHNELLER. The development and treatment of myopia. *Danziger Ztg.*, 1888.

80. SEGGEL. The question of myopia. *Münchener med. Wochenschr.*, 1888, No. 2.

81. SILEX, P. Report on the first ophthalmic examination of the inmates of the Rummelsburg Orphan Asylum. Berlin, 1888.

82. STILLING, J. The shape of the skull and myopia. Wiesbaden, 1888, J. F. Bergmann. 124 pp.

83. THEOBALD, SAM'L. Notes of two cases of reflex paralysis of accommodation with mydriasis due to dental irritation, with observations on their supposed bearing upon the question of the pathogenesis of sympathetic ophthalmia. *N. Y. Med. Rec.*, Feb. 25, 1888.

84. WEISS, L. Contributions to the anatomy of the orbit. Tübingen, 1888, H. Laupp. 176 pp.

COHN (70) found very few myopes in the schools of Constantinople. This he is inclined to attribute to the small amount of writing and the manner in which it is performed.

GREEN (73) reports that while recovering from an acute attack of double iritis he found that he had become myopic 1 to 1.5 D, which gradually passed away in the course of about six weeks.

BURNETT.

Harper (74) relates three cases of severe conjunctival and corneal inflammation which were apparently due to the strain caused by hyperopic astigmatism. Correcting glasses gave permanent relief. Burnett.

Hosch (75) reports five cases of uniocular paresis of accommodation in inveterate syphilis, which could not be cured.

Martin (76) tries to prove in a long paper that hemicrania is an arthritic disease which only appears in cases of partial contraction of the ciliary muscle. In the majority of patients the static astigmatism is corrected by a partial contraction. When this astigmatism is not present or not well marked, we find spastic contraction. Among 352 patients suffering with hemicrania he found 285 in whom the static astigmatism was corrected by the contraction of the ciliary muscle, while he only found 67 cases of spastic contraction. In 66 cases the astigmatism corrected equalled 0 25 D, in 121 0.50 D, in 7.7 0.75 D, in 18 1 D, in 2 1.25 D, in 1 1.50 D. In 7 cases the spastic contraction equalled 0.25 D, in 33 0.50 D, in 18 0.75 D, in 9 1.00 D. When only one eye is astigmatic, the hemicrania is confined to that side. In proof of these views he reports a large number of clinical histories. He distinguishes between a "migraine vulgaire" and a "migraine ophtalmique." From the paper in question it becomes evident that his former one (*Ann. d'ocul.*, vol. xcix., p. 24) refers only to the "migraine vulgaire." He now makes the same assertions in regard to the "migraine ophtalmique." The development of migraine depends upon three factors: 1, a constitutional anomaly, arthritis; 2, partial contraction of the ciliary muscle; and 3, upon accidental causes, varying with each case. In proof Martin quotes a number of clinical histories and concludes from them as follows: "Our theory of astigmatism as the cause of migraine ophtalmique therefore rests upon a number of proofs: first, upon the constancy of the astigmatic contraction; secondly, upon the confinement of unilateral migraine to the side of this contraction; and, finally, to the good effect of cylindrical glasses. Marckwort.

Risley (77) reports nine additional cases to the thirteen he has already recorded in the Transactions of the Society, in which he has observed the hyperopic pass into the myopic refraction. He makes the statement that "without exception they passed from the shallow hypermetropic eyeball over into the lengthened eyeballs through the turnstile of astigmatism." Burnett.

Saltini (78) examined in Parma 954 school children of both sexes and found among them 24.64 % myopes. In only 15.75 % of the latter a hereditary disposition could be shown. Between the age of 11 and 12 there was myopia in 13 %, between 13 and 18 in 27 %, and over 20 in 29 %. Measurements of the skull in addition to the 548 previously made gave the following results: among 389 myopes there were 14.6 % dolichocephalous, 22.42 % mesocephalous, and 62.98 % brachycephalous skulls; among 985 emmetropes there were 9.63 % dolichocephalous, 18.17 % mesocephalous, and 71.46 % brachycephalous skulls; among 128 hypermetropes there were 10.49 % dolichocephalous, 19.52 % mesocephalous, and 69.35 % brachycephalous skulls. DANTONE.

According to SCHNELLER (79) myopia is due in 12 % to an increased curvature in the refractive media, and in 88 % to a lengthening of the axis of the globe.

SILEX (81) found among 702 eyes 305 emmetropic, 245 hypermetropic, 65 myopic, and 87 astigmatic.

STILLING (82) has measured the skulls of many persons and found that a low orbit is usually associated with myopia, a high orbit with hypermetropia and emmetropia. Brachycephalia predisposes to myopia, and dolichocephalia to hypermetropia.

THEOBALD (83) relates the histories of two cases of reflex paralysis of accommodation and mydriasis from decayed teeth and adduces the facts in support of his theory on the reflex production of sympathetic ophthalmia, published in these ARCH., vol. xviii., No. 1. BURNETT.

WEISS (84) made anatomical investigations as to the causes of myopia, and found that the optic nerve is not exposed to any strain by the movements of the eyes when the piece extending from the anterior end of the optic canal to the insertion at the globe is long, but that such strain results when this piece is short. This strain accounts for the tissue-changes at the extreme end of the optic nerve. When, however, the growth of the body has ceased, the influence of this strain as a cause of myopia ceases.

VII.—LIDS.

85. ADAMÜCK, E. A remarkable anomaly of motility of the lids and eyes. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxvi., p. 191.

86. ALLPORT, FRANK. An operation for simple forms of entropium. *Amer. Jour. Ophth.*, vol. v., 3, p. 78.

87. BOUCHERON. Opération nouvelle pour l'ectropion. *Soc. franç. d'ophth.*, 1888.

88. Germann, Th. The treatment of trichiasis and distichiasis due to entropium. *Mittheil. aus d. Petersb. Augenheilanst.*, 1888, No. 12, p. 62.

89. Hewkley, T. Fugitive iodism; œdema of eyelids. *Brit. Med. Jour.*, 1888, p. 1160.

90. Hotz, F. C. The reposition of the edge of the lid in trichiasis of the upper lid. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxvi., p. 98.

91. Huneke. Ectropium operation by transplantation of epidermis after Eversbusch. *Münchener med. Wochenschr.*, 1888, No. 15, p. 250.

92. Jacobson, J. The intermarginal incision with and without transplantation of skin in the therapy of diseases of the edge of the lid. *Beiträge zur Pathologie des Auges.* Leipzig, 1888, W. Engelmann, p. 93.

93. McKeown. Spastic entropion treated by stretching the orbicularis. *Brit. Med. Jour.*, Jan. 7, 1888, p. 19.

94. Van Millingen. De la guérison radicale du trichiasis par la tarso-cheilo-plastie. *Arch. d'ophth.*, vol. viii., 1, p. 60.

95. Pedraglia and Deutschmann. Chronic œdema of the lids in inflammation resembling erysipelas, with formation of tumors at the edge of the lids. *Graefe's Arch. f. Ophth.*, vol. xxxiv., 1, p. 161.

96. Richey, S. O. Eczema simplex dependent upon ametropia. *Chicago Med. Jour. and Exam.*, April, 1888.

97. Robinson, Thos. Fugitive œdema of eyelids. *Brit. Med. Jour.*, 1888, No. 1428, p. 1006.

98. De Vincentiis. Caso di cancro delle palpebre. *Ann. di ottalm.*, vol. xviii., p. 64.

99. Wicherkiewicz, B. A sure operative treatment for trichiasis and distichiasis. *Berlin. klin. Wochensch.*, 1888, No. 6.

100. Williams, A. D. Epithelioma apparently cured by gasoline. *St. Louis Med. and Surg. Jour.*, vol. lix., No. 3, p. 178.

101. Williams, A. D. A new operation for entropium. *St. Louis Med. and Surg. Jour.*, vol. lix., No. 2, p. 106.

Adamück (85) observed in a man aged forty a rising and drawing back of the lids with every movemeut of the jaws, so that the eyes became more and more prominent. When the chewing ceased the eyes gradually returned to their normal position.

Boucheron (87) recommends for senile ectropium of the lower lid excision of the tarsus, which is performed from the conjunctiva. A strip of tarsus one *mm* wide is left behind. In total ectropium the whole tarsus is excised (with the exception of the strip mentioned), in partial ectropium only a portion.

Marckwort.

Germann (88) recommends a modified Snellen-Hotz operation in cases of entropium combined with trichiasis and districhiasis.

Hewkley's (89) patient, a man aged thirty, had used iodide of potassium on account of frontal neuralgia. A severe coryza ensued, which ceased after an hour, and was followed by swelling of the lids of the left eye, lasting two days. Werner.

In trichiasis of the upper lid, Hotz (90) divides the skin at the upper edge of the tarsus, removes a strip of muscle a few *mm* wide, and thus exposes the upper edge of the tarsus. Then he detaches the remainder of the pars ciliaris and the orbicularis muscle in connection with the skin from the tarsus down to the roots of the eyelashes. Just above the latter he makes a transverse cut through the cartilage to the posterior edge of the lid. Above this he makes another cut, the distance of which from the other depends upon the size of the piece of tarsus to be excised. The second cut passes diagonally downward, meeting the other at an acute angle at the posterior edge of the lid. In this manner he excises a wedge-shaped piece of cartilage. Three or four sutures are then applied by passing the needle through the edge of the lower incision through the lid, then through the upper edge of the tarsus, and finally through the upper edge of the incision through the skin. [The Streatfeild-Snellen operation without excision of skin. H. K.]

Huneke (91) covered a large defect of the upper lid due to lupus with four or five smaller and eight or nine larger pieces of skin according to Eversbusch. The result was excellent.

Jacobson (92)makes an intermarginal incision 6–8 *mm* long in trichiasis. Then he takes a strip of skin from the temporal end and fastens it in the intermarginal space.

McKeown (93) treated an entropium of the upper lid in an old lady suffering with conjunctivitis by keeping the lids apart with the speculum for a minute.

Van Millingen (94) operates for trichiasis by dividing the edge of the lid between the lashes and Meibom's glands, thus making a wound 2–3 *mm* wide and becoming narrowed towards the sides, into which he transplants a corresponding strip of mucous membrane from the lips, keeping it in position with a bandage. He began to operate according to this method in 1877, and has used it exclusively for the last three years. He claims priority against Jacobson and Burchardt, basing his claim on his publications in 1877 and 1882. V. MITTELSTÄDT.

PEDRAGLIA and DEUTSCHMANN (95) found peculiar formations resembling tumors at the edges of the lids, which they think developed from the secretion of Meibom's glands, the glands of the eyelashes, or the sebaceous glands of the edge of the lid respectively.

RICHEY (96) reports a second case of eczema on the malar prominence, which seemed due to ciliary strain, and which disappeared on the correction of 2 D of H. BURNETT.

ROBINSON (97) saw in a woman aged 46 fugitive œdema of the lids, which lasted 2 or 3 days. She suffered with headache and frequent attacks of erysipelas of the face.

DEVINCENTIIS (98) describes a case of epithelioma of the lower lids which had probably taken its origin in Meibom' glands. DANTONE.

In operating for trichiasis and distichiasis Wicherkiewicz (99) first divides the edge of the lid, the anterior portion containing the skin, muscles, and lashes, the posterior the tarsus and conjunctiva. He then attaches the free ciliary margin to the loose tissue covering the tarsus with 3 sutures. He then transplants a piece of skin, which he excises from the upper lid, into the intermarginal space.

VIII.—LACHRYMAL APPARATUS.

102. ALBINI, E. Sulla dacrioadenite sifilitica. *Ann. di ottalm.*, vol. xvi., 5–6, p. 501.

103. DESPAGNET. Des tumeurs malignes de la caroncule. *Rec. d'ophth.*, 1888, No. 1, p. 37.

104. DOLGENTHOW, W. Rare case of petrifaction of a hypertrophic fœtal caruncle of the right eye. *Wjestnik Ophth.*, vol. v., 1, p. 19.

105. GRÜNHUT, R. Two cases of concretions of fungi in the lower lachrymal canal. *Prager med. Wochenschr.*, 1888, No. 33.

106. MOAURO. Angio-mixo-sarcoma bilaterale del sacco lagrimale con degenerazione jalina delle pareti vasali. *Riv. Ven. d. sci. med.*, 8818.

107. NOYES, H. D. Spontaneous prolapse of the lachrymal gland—its extirpation. *Trans. Amer. Ophth. Soc.*, 1887.

108. SCHEFF, J. The differential diagnosis of the fistula of the cheek and gums below the inner canthus, and the lachrymal fistula. *Wiener med. Wochenschr.*, 1888, No. 12.

109. WIDMARK, J. Nagra bacteriologisk-optalmiatriska studier. *Nord. Ophth. Tidsskrift.*, 1888, Nos. 1 and 2.

ALBINI (102) observed a tumor of the lachrymal gland in a syphilitic young woman. It was removed. It was 23 *mm* long and 12 *mm* wide; the microscopic examination showed that the glandular elements, with the exception of a few peripheric portions, had been replaced by young but already organized connective tissue. He found a few giant cells, but no Lustgarten bacilli.

DANTONE.

DESPAGNET (103) gives a clinical and anatomical description of two tumors of the caruncle; a melanotic epithelioma and a sarcoma. They were pedunculated and could be easily removed. The wound was cauterized after removal. Five months later there had been no relapse, nevertheless Despagnet is doubtful on this point. The anatomical examination shows that tumors of the caruncle are not so benign as is generally supposed.

MARCKWORT.

GRÜNHUT (105) reports two cases in which he found streptotrix Försteri in the lower lachrymal canal.

NOYES' (107) patient was a girl 20 years of age, who nine years ago had noticed a soft movable tumor under the right upper lid. The other eye had been lost by an accident, but no injury had occurred to the right. The character of the tumor was unsuspected until its removal, when it was found to be the lachrymal gland. The healing was prompt and no unpleasant effect followed.

BURNETT.

According to SCHEFF (108) the fistula of the cheek and gums is distinguished from the lachrymal fistula by the fact that the former is never situated exactly at the infraorbital margin, but below it. The fistula can be probed only downward and backward.

In order to study the effect of the bacteria of the lachrymal sac upon the healthy conjunctiva and lachrymal sac, WIDMARK (109) introduced the lachrymal secretion from three patients into the eyes of healthy persons, 7 times in all. With the exception of slight lachrymation and injection lasting a few hours, no change was noticed. The author, therefore, thinks that the bacteria are harmless when the conjunctiva and lachrymal sac are healthy; he assumes that an obstruction to the escape of the tears may perhaps be the cause. Since publishing his paper in "Hygiea," 1887, he has made cultures in two cases of serpent ulcer, finding in one the streptococcus pyogenes, in the other another micrococcus. He has also examined 25 cases of blepharadenitis and always found the streptococcus pyogenes. When gelatine containing bacteria is introduced into a pocket-like wound of the conjunctiva of the globe, a pustule is the result. When a culture emulsion of staphylococcus pyogenes is injected under the conjunctiva, a local infiltration with catarrh of the conjunctiva ensues. The author thinks that the plyctenula and blepharadenitis are due to infection, the same micro-organism being the cause in both. SCHIÖTZ.

IX.—MUSCLES AND NERVES.

110. ABADIE. De l'opération du strabisme. *Soc. franç. d'ophth.*, 1888.

111. BULL, C. S. Passive motion in the treatment of paralysis of the ocular muscles. *Trans. Amer. Ophth. Soc.*, 1887.

112. EALES, H. Anæsthesia during strabismus operations. *Brit. Med. Jour.*, Feb., 1888, p. 349.

113. FROST, A. On some points connected with concomitant convergent squint. *Brit. Med. Jour.*, Apr., 1888, p. 783.

114. JAVAL. Sur le traitement orthoptique du strabisme. *Soc. franç. d'ophth.*, 1888.

115. LANDOLT, E. La vision binoculaire après l'opération du strabisme. *Arch. d'ophth.*, vol. viii., 1, p. 34.

116. LIPPINCOTT, J. A. Sharply circumscribed hyperæmia occurring in connection with muscular insufficiency. *Trans. Amer. Ophth. Soc.*, 1887.

117. SMITH, PRIESTLEY. Cocaine in squint operations. *Brit. Med. Jour.*, Feb., 1888, p. 74.

118. TILLEY, ROBERT. Monocular diplopia without manifest lesions of the affected eye. *Jour. Amer. Med. Assoc.*, March 17, 1888.

119. Wadsworth, O. F. A case of recurrent paralysis of the motor oculi. *Trans. Amer. Ophth. Soc.*, 1887.

Abadie (110) recommends tenotomy combined with advancement in cases in which the strabismus exceeds 3–4 *mm.* He thinks that an orthoptic treatment is useless. The correctness of his assertion was denied to a greater or less extent by all who took part in the discussion. Galezowski is opposed to the advancement of Tenon's capsule. Boucheron thinks that in very young children mydriatics or myotics aid the orthoptic exercises.
Marckwort.

Bull (111) reports 21 cases in which he tried passive motion in the treatment of paralysis of the various external ocular muscles in the manner first proposed by Prof. Michel. The paralysis was entirely cured in 8 cases, improved in 6, and not benefited at all in 7. Burnett.

Eales (112) uses nitrous-oxide gas as an anæsthetic in operating for strabismus.

Frost (113) discusses the relation of convergence and accommodation to squint. In most cases amblyopia of the squinting eye is the cause. In alternating strabismus there is a preponderance of the internal recti. Werner.

Javal (114) shows a stereoscope constructed by Bull for the measurement of strabismus and for exercises. Landolt recommends for the purposes of measurement the observation of the reflex of the deflected cornea upon a scale. According to Vacher the orthoptic treatment is useless when the image cannot be united with a prism at 4°. Dor measures the deviation with prisms; a muscular insufficiency of more than 10° he considers too great for orthoptic treatment. According to Meyer, the benefit derived from stereoscopic exercises is undeniable when the strabismus has existed only a short time. Landolt recommends orthoptic exercises especially after the operation. Boucheron calls attention to the inconstancy of the degree of deviation. The strabismus is composed of a fixed and a variable portion; the latter is neutralized by mydriatics. According to Abadie, exercises improve vision only slightly; binocular vision is obtained by the operation, no orthoptic exercises being necessary for that purpose. Javal reports two clinical histories to demonstrate the usefulness of stereoscopic exercises. By exercising the internal recti, deviations of 15° to 20° can be corrected.

Marckwort.

Landolt (115) thinks that the highest aim in every treatment of strabismus should be the restoration of binocular vision. The first attempts should aim at removing or diminishing the deviation with the aid of glasses, atropine, and the stereoscope, while surgical treatment should be directed toward the obstacles which cannot be overcome in any other manner. After the normal position has been re-established the orthoptic exercises must be continued to regain binocular vision and thus make the cure permanent. The author reports nine cases, showing that this result can be obtained even under very difficult circumstances. In some of them there had never been binocular vision; in others there was a high degree of anisometropia, uni- or binocular amblyopia, and difficulty in uniting the retinal images on account of a difference in elevation. v. Mittelstädt.

Lippincott (116) relates the clinical histories of two cases in which there was a sharply defined redness like an episcleritis over the tendon of the recti muscles, associated with muscular insufficiency and asthenopic symptoms. The symptoms disappeared on the use of strychnia and hot douches to the eyes.

Burnett.

Priestley Smith (117) injects cocaine under the conjunctiva.

Werner.

Tilley (118) reports a case of monocular diplopia in a girl of nine, which seems to be undoubted as to its genuineness, but for which no lesion in the eye could be found. Later she developed some cerebral disturbance of an obscure character, and abscesses appeared all over the body. Burnett.

Wadsworth (119) gives a full history of a case of recurrent paralysis of the motor oculi in a girl who was at the same time affected with otitis media; also the history of a sister who had other eye troubles probably dependent upon the same cause. In the author's opinion the paralysis is most likely due to a meningitis set up by the aural disease, which had exacerbations and remissions. Burnett.

120. Moebius, P. J. On congenital bilateral paralysis of the abducens and facial nerves. *Münchener med. Wochenschr.*, 1888, No. 6.

121. Ranney, A. L. The treatment of functional nervous diseases by the relief of eye-strain. *N. Y. Med. Jour.*, Jan. 7 and 14, 1888.

122. Shakespeare, E. O., and de Schweinitz, G. E. An un-

usual case of ciliary neuralgia with an erratic history : a clinical study. *Amer. Jour. Med. Sci.*, March, 1888.

123. SILVA. Un caso di optalmoplegia totale externa unilaterale di origine basilare. *Ann. di ottalm.*, vol. xvi., Nos. 5 and 6, p. 455.

124. THOMSEN. Acute alcoholic paralysis of the ocular muscles ending in recovery. *Berliner klin. Wochenschr.*, 1888, No. 2.

MOEBIUS (120) thinks that the congenital bilateral paralysis of the facial and abducens nerves is an idiopathic pathological condition. There is a lesion in the region of the two abducens nuclei.

RANNEY (121) is a thorough believer in the production of various functional nervous diseases by eye-strain, and is one of the most ardent defenders of the method of treatment by partial tenotomies of the recti muscles so largely practised by Dr. G. T. Stevens. Among the related cases of nervous disturbances relieved by these tenotomies were : chronic epilepsy, severe headaches, melancholia, cerebral neurasthenia, and chorea. The author makes the statement that he has never seen a case of typical periodical sick headache in which the eye muscles were not at fault. BURNETT.

In the case of SHAKESPEARE and DE SCHWEINITZ (122) the cause of the neuralgia was obscure, and the malady was not relieved after seven years of treatment. The eye symptoms were keratitis and corneal opacity, which finally resulted in obliteration of vision in the left eye. At her earnest solicitation the eye was enucleated, but in three weeks the pain made its appearance in the other eye, followed by a keratitis similar to that in the left. The fact that the attacks of pain started at the tendo oculi induced the surgeons to try Badal's operation of stretching and excising a piece of the supratrochlear nerve, but no permanent relief followed. The patient is still under observation, the pain recurring regularly every seven days. BURNETT.

SILVA (123) observed in the left eye of a farmer aged forty-eight complete paralysis of the optic and oculomotor nerves, marked paresis of the trochlearis and abducens nerves, and slight mydriasis ; the fundus was normal. In the right eye there was slight limitation of the color-field. The symptoms gradually vanished under the use of mercury and iodide of potassium, and at the end of a month there only remained red-blindness and a few small defects of the visual field. The author is inclined to seek the cause of the various paralyses in a disturbance of the irrigation of the nerve-centres by the art. cerebralis profunda. DANTONE.

THOMSEN (124) observed a case of acute alcoholic paralysis of the ocular muscles, which was cured. He believes that the alcohol neuritis is of central origin in some cases, of peripheral in others.

X.—ORBIT AND NEIGHBORING CAVITIES.

125. ADAMS. Pulsating tumor of the orbit with proptosis. *Ophth. Soc. Unit. Kingd.*, March 18, 1888.

126. ELSCHING. A case of hydrops of the frontal sinus. *Wiener med. Wochenschr.*, 1888, No. 14.

127. FANO. Fibrome sous-cutané du grand angle de l'orbite. *Jour. d'ocul. et de chir.*, Feb., 1888.

128. GOTTI. Una cisti sierosa dell'orbita. *Bull. di sci. med.*, vol. xxi., 1–2, p. 75.

129. HULKE. Pulsating tumor of the orbit with proptosis. *Ophth. Soc. Unit. Kingd.*, March, 1888. Exophthalmus after injury.

130. KÖHLER, A. Report of cases of injury of the optic nerve within the orbit. *Berliner klin. Wochenschr.*, 1888, No. 24.

131. LANNEGRACE. Relations de la toux nerveuse avec le goître exophthalmique. *Rev. des sci. med.*, vol. xxxi., 1, p. 114.

132. LAWFORD, J. B. Four cases of orbital sarcoma in children. *Ophth. Hosp. Rep.*, vol. xii., p. 43. Four cases.

133. PANAS. Hématome spontané de l'orbite, avec un nouveau fait clinique à l'appui. *Arch. d'ophth.*, vol. viii., 2, p. 153.

134. PESCHEL. Un caso di esoftalmo pulsante idiopatico. *Boll. d'ocul.*, vol. x., 1–2.

135. TILLAUX. Kyste séreux congénital de l'orbite. *Rec. d'ophth.*, 1888, No. 1, p. 1.

136. WILLIAMS, CORNELIUS. A case of rupture of the internal carotid artery within the cavernous sinus; pulsating exophthalmus; ligature of the internal carotid artery; death; autopsy. *Jour. Amer. Med. Assoc.*, Jan. 7, 1888.

137. YATES, PETER. Exostosis of orbit associated with cerebral tumor. *Brit. Med. Jour.*, March 24, 1888, p. 646.

Elsching's (126) patient had been injured 12 years ago. Hydrops of the frontal sinus was the result. There was also limitation of the movements of the globe, and ptosis. The anterior wall of the sinus was opened and a piece removed, whereupon the eyeball recovered its normal position and mobility. Ptosis remained.

Gotti (128) observed in the right orbit of a boy aged 14, a tumor which had existed for 2 months. It proved to be a serous cyst, and disappeared after it had been punctured and a compressive bandage applied. The eye had not suffered in any way.

In a man who had been shot with a revolver in the right temple, Köhler (130) saw exophthalmus, mydriasis, hemorrhages into the retina and vitreous, narrowness of the retinal arteries and tortuosity of the veins. Two months later the eye had become amaurotic, and the mobility limited. The bullet had injured the optic nerve, the external and internal recti muscles, and had then entered the nasal cavity.

Panas (133) observed one of the rare cases of spontaneous hemorrhage into the orbit, which occurred in an unusually fat boy of 4 years, of healthy family, who frequently suffered with epistaxis, vomiting, and dilatation of the stomach, with dyspetic symptoms, but was otherwise healthy. When he awoke in the morning he could not open the left eye ; the lids were œdematous but not discolored, the eyeball protruded and was almost immovable, the pupil wide and did not react ; the ophthalmoscope showed a pale disc and dilated tortuous veins. V=0. On palpation the bulging lachrymal gland could be felt, likewise fluctuation of the contents of the orbit. An incision 3 *cm* deep was made between the eyeball and the orbital margin, whereupon a large quantity of fresh blood escaped. A drainage tube was inserted and a bandage applied, and the following day the eye had almost regained its normal position, the pupil reacted slightly, and a little sight had returned. The exophthalmus, however, soon returned, the boy bled from the nose and vomited, and a local phlegmon of the orbit developed, from which he slowly recovered. The disc remained pale, and the pupil reacted only consensually. In discussing the cause of the trouble the author comes to the conclusion that the orbital hemorrhage as well as the epistaxis, which occurred simultaneously with the vomiting, was due to a vasomotor irritation proceeding from the stomach, a careful examination failing to reveal any other source. Panas thinks that the spontaneous hemorrhages into the vitreous occurring in young people may perhaps be ascribed to such reflex irritation proceeding from the stomach or other organs. As the wound may easily be disinfected and the hemorrhage may readily return, he thinks it advisable not to operate. V. MITTELSTÄDT.

PESCHEL (134) observed in a young man aged 15 pulsating exophthalmus, which had suddenly developed a month ago without any assignable cause, and was attended with severe headache. Besides the protrusion of the eyeball he found œdema of the temporal part of the palpebral conjunctiva and engorgement of the fundus; the aneurismatic noises could be heard all over the head. The blowing sound ceased on compression of the left carotid, but although this was done methodically for 9 days, the other symptoms increased to an alarming extent, paralysis of the abducent and then of the oculomotor nerve followed, and finally anæsthesia of the cornea and kerato-iritis. The common carotid was thereupon ligated, with good result: the above mentioned symptoms gradually disappeared, and 7 months later there remained only slight exophthalmus, a low murmur and slight paresis of the abducent. V had risen to $\frac{1}{5}$. The auther finds that none of the theories thus far advanced will explain his case, and, therefore, makes the diagnosis of a sudden rupture of the carotid within its passage through the cavernous sinus. The young patient felt perfectly well, with the exception of a strong inclination to palpitation of the heart and a more rapid pulse. DANTONE.

TILLAUX (135) describes a case of congenital cyst of the orbit and microphthalmus. In the lower part of the orbit there was a cyst which pushed the lower lid outward and had dislocated the very small eyeball upward. Besides remnants of a persistent pupillary membrane, he also found a coloboma of the choroid. In regard to sight, he only says: "These anomalies of development form at the expense of the functional integrity of the eye." As the cyst could not be reached from the conjunctiva, the incision was made through the skin of the lower lid. The cyst burst during the operation, and it was found to be united with the posterior part of the globe, so that it could not be cleanly removed. This was probably the cause why phlegmon of the orbit followed, which endangered the patient's life, so that Tillaux advises not to touch such cysts, unless the operator is prepared to remove the globe also. The microscopic examination revealed in the wall of the cyst transparent and parallel hyaline lamellæ, which were separated by smooth cells. The tissue resembled that of the cornea more than that of the sclera. According to Tillaux the congenital cyst of the orbit with microphthalmus must be regarded as a diverticulum of the globe. MARCKWORT.

In WILLIAMS' (136) case a neuro-retinitis was associated with the other conditions. Death took place from a secondary hemorrhage. The post-mortem was imperfect and unsatisfactory.

BURNETT.

In YATES' (137) case there was a hard, nodulated exostosis of the left orbital plate, encroaching on the cranial cavity and producing extreme proptosis. Associated with this was a myxomatous tumor of the frontal lobe. There was a history of slight epileptiform seizures ; no pain or other symptoms. WERNER.

XI.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

138. AHLFELD. The prevention of infectious disease of the eye during the first week of life. *Berliner klin. Wochenschr.*, 1888, No. 14.

139. BAAS. Toxic inflammation of the conjunctiva (due to a processionary caterpillar). *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxvi., p. 63.

140. CZERMAK. Symblepharon in both eyes following pemphigus. *Wiener med. Wochenschr.*, 1888. Observed in a boy aged four.

141. DOBBERKE, J. L. Periocular neoplasm in conjunctiva en orbitaal celweefsel. *Feestbundel Donders Jubiléum*, 1888, p. 522.

142. v. ENGEL, G. The prophylactics of some diseases of the conjunctiva in the new-born. *Wiener med. Presse*, 1888, No. 8.

143. ERNST, P. On the bacillus xerosis and its manner of forming spores. *Zeitschr. f. Hygiene*, 1888, vol. iv.

144. FOERSTER. The pseudo-Egyptian ophthalmia. *Correspondenzbl. d. Verbandes d. Schles. Aerzte-Vereins*, 1888, No. 19.

145. GALLENGA. Brevi osservazioni sulla xerosis epiteliale e suoi microorganismi. *Ann. di ottalm.*, vol. xvi., 5–6, p. 493.

146. HANSEN GRUT, E. Conjunctivitis æstivalis. *Nord. ophth. Tidsskrift*, 1888, 1–2.

147. HOOR, CARL. The treatment of acute ophthalmo-blennorrhœa. *Wiener med. Wochenschr.*, 1888, Nos. 10 and 11.

148. Jacobson, J. Contribution to the knowledge of follicular conjunctivitis (granular ophthalmia). Contribution to the pathology of the eye, Leipzig, 1888, p. 130.

149. Mules, P. H. Ophthalmia neonatorum : treatment by alcohol and corrosive sublimate. *Brit. Med. Jour.*, 1888, p. 244.

150. Petresco. Sur la nature microbienne des granulations conjonctivales. *Soc. franç. d'ophth.*, 1888.

151. Peunow. Contribution to the surgical treatment of trachoma. *Wjestnik ophth.*, 1888, No. 1. p. 1.

152. Reich, M. On the early and middle stages of the development of follicular conjunctivitis (trachoma). *Wratsch*, 1888, No. 7.

153. Sattler, H. On a peculiar syphilitic affection of the conjunctiva. *Prager med. Wochenschr.*, 1888, No. 12.

154. Schilling. Endemic follicular conjunctivitis and trachoma. *Berliner klin. Wochenschr.*, 1888, No. 22.

155. Schröder, Th. A new method of the surgical treatment of chronic follicular trachoma. *St. Petersb. med. Wochenschr.*, 1888, No. 1.

156. Staderini. Ricerche sulla istologia e sulla patogenesi della congiuntivite tracomatosa e sulla cura di questa mediante il sublimato corrosivo. *Ann. di ottalm.*, vol. xvi., 5–6, p. 367.

157. Theobald, Samuel. The pathogenesis of pterygium. *Trans. Amer. Ophth. Soc.*, 1888.

158. Tilly, R. A case of pemphigus of the conjunctiva, with remarks. *Jour. Amer. Med. Assoc.*, Feb. 4, 1888.

159. Venneman. Sur la diphthérie de la conjonctive et son traitment par le jus de citron. *Soc. franç. d'ophth.*, 1888.

160. Wadsinski, P. On the surgical treatment of trachoma. *Wjestnik ophth.*, 1888, No. 2, p. 97.

161. Wallerstein, H. On endemic acute follicular conjunctivitis. *Berliner klin. Wochenschr.*, 1888, No. 20.

Ahlfeld (138) has lately abandoned the instillations according to Credé, but nevertheless has not observed any cases of blennorrhœa at the Marburg gynæcological clinic. As soon as the head has appeared he washes the face and eyes with ordinary water and then covers the child's face with a folded cloth, so that the vaginal discharge cannot come in contact with the eyes of the child. He also recommends previous irrigations of the vagina with solutions of corrosive sublimate.

Paass (139) observed severe conjunctival iritation in workmen into whose eyes the hairs and scales of the processionary caterpillar had fallen.

Dobberke (141) observed the development of clear, polypous nodules in a girl aged nine, which came from the ocular conjunctiva and the fornix, and which returned in a harder form when they were removed, so that half a year later total exenteration of the orbit became necessary, though sight was still quite good. The exenteration according to Langenbeck's method was entirely successful. The tumor consisted of three separate nodules, which were connected with the eyeball and conjunctiva by very loose connective tissue. Around the optic nerve a few nodules the size of a pea ware found, which were attached to it in a similar manner. The nature of the tumor was difficult to determine, as it resembled both a round-cell sarcoma and a lymphoma.

Westhoff.

According to v. Engel (142) the infection in blennorrhœa neonatorum does not take place in the vagina, but as soon as the head passes through the distended cervix uteri. He recommends Credé's method.

According to Foerster (144) the name "Egyptian ophthalmia" can no longer be justly applied, as the two forms which we now alone include in it, trachoma and follicular conjunctivitis, are not as infectious as the Egyptian ophthalmia was formerly supposed to be. He then describes the symptoms of both affections, their differential diagnosis and treatment, and maintains the relative harmlessness of trachoma when treated in time. He justly doubts the great infectiousness of the latter disease, as in the course of thirty years he has not seen a single case in which one of his attendants or a physician was infected.

According to Gallenga (145) the cultures of the bacillus of xerosis succeed best on sterilized blood-serum, which may also be mixed with diseased, serous exudations from the various cavities of the body. On other soil the development is very feeble or fails entirely ; weak solutions of eserine, atropine, or pilocarpine check it. The bacilli obtained from cultures, as well as from the xerotic spots, can be introduced into the conjunctival sac of man or under the conjunctiva of rabbits without producing any changes. As regards the cure of xerosis, the author attaches no value to either eserine or sublimate ; benefit can be derived only from better hygienic conditions and better nourishment.

DANTONE.

HANSEN GRUT (146) considers the most characteristic symptom of the disease in question the flat granulations of the upper lid ; they may be very large, but are always flat. Vernal catarrh is often confounded with trachoma, but never produces scars or curvature of the tarsus ; the cornea is never attacked. The lower lid remains free from granulations. When the granulations have disappeared the conjunctiva becomes smooth and whitish, as though covered with a film of milk. To prevent the frequent relapses, the diseased epithelium and hyperplastic layer of mucous membrane must be destroyed ; the principal remedy is therefore Paquelin's thermo-cautery.

SCHIÖTZ.

HOOR (147) at first uses ice-applications and frequently washes the eyes out with permanganate of potash.

JACOBSON (148) includes under follicular affections of the conjunctiva follicular catarrh, acute granular conjunctivitis, and trachoma, and separates them distinctly from catarrh of the conjunctiva, blennorrhœa, croup, and diphtheria, which he includes under the head of non-follicular diseases. He subdivides the follicular diseases of the conjunctiva into follicular catarrh (catarrh with swelling of the follicles) and follicular inflammation. The former develops without any symptoms, or with those of a more or less acute catarrh. Round, translucent, superficial nodules develop usually first in the lower fornix and the conjunctiva of the tarsus. The secretion consists of clear or somewhat flocculent tears, sometimes also films of mucus in the depth of the fornix. In all its other symptoms the clinical picture resembles that of the various forms of catarrh from the chronic to the hyperacute. All variations are due to complications. Follicular inflammation is one of the severest ocular affections on account of the numerous relapses and the participation of the cornea. The common and characteristic symptom of follicular inflammation is the development of follicles together with lymphoid infiltration, the source of which is the adenoid substance. Though beginning with great severity, it runs a tedious course, marked by exacerbations and relapses. Restitutio ad integrum rarely occurs, cannot be expected before the lapse of several months, and cannot be accomplished with certainty, even though treatment be begun at an early date The disease ends in induration, atrophy with characteristic scars, total xerosis, and disastrous changes in the cornea, conditions which it may require years to develop and which may become stationary at any stage. Follicular catarrh heals under favorable circumstances without any treatment, or after frequent instillations of boric-acid solutions, the application of nitrate of silver, acetate of lead, sulphate of zinc. Follicular inflammation is cured occasionally in recent cases. This result may be attained with scarifications and cold applications, or with lukewarm applications and sulphate of copper. The prognosis is uncertain in either case, and relapses are frequent. The only effective is the operative treatment which frequently is a radical one, and which may be one of the three following: (1) Deep incisions of the upper conjunctiva tarsi, when the infiltration is recent; (2) excision of the upper fornix, when there is marked development of follicles in the retrotarsal fold and in the fornix; (3) partial or total excision of the tarsus and the diseased fornix down into the conjunctiva of the globe, in cases of marked general infiltration, and in the third stage. As regards transmission of the disease, it has been shown that it can spread through the discharge, and an atmospheric contagion is very probable.

MULES (149) treats blennorrhoic conjunctivitis by wiping the everted lids, and brushing them with alcohol; he also washes them with corrosive sublimate (1 : 2000).

PEUNOW (151) has tried the various operative procedures for trachoma, and favors the scraping out of the granulations with a sharp spoon. When, however, they form a fold, he excises the latter before scraping out the remaining granulations. When they cannot all be scraped out on account of marked infiltration, he presses out the remainder with the fingers or forceps. In this manner Peunow treated 180 patients, whom he divides into three groups. The first—43 patients—comprises those cases in which the trachoma-granules had developed upon the normal or only slightly hyperæmic conjunctiva. The results were excellent. The treatment lasted from ten to thirty days; the spoon was used from one to three days. All were completely cured. Thus far no relapses (some were treated more than a year ago). Second group—102 patients—trachoma with marked hyperæmia and swelling of the conjunctiva, and muco-purulent discharge. Length of treatment, fifteen to sixty days; the spoon was used from two to five days. Fifty patients were completely cured; in 32 there was thickening of the palpebral conjunctiva, while in the remainder there was thickening and unevenness of the conjunctiva; in three some granulations remained, as they lay deep in the tissue, and could not therefore be perfectly scraped out. Peunow did not observe any relapses among those discharged cured. Third group—35 patients—trachoma with scars of the conjunctiva and corneal complications. Length of treatment, two months and more. In some cases there remained unevenness and pannus, which yielded to jequirity. HIRSCHMANN.

REICH (152) is against the recognition of a special, not specific, follicular conjunctivitis (as demanded by Adamück) among the various forms of trachoma. Folliculosis, identical with the follicular conjunctivitis of Chodin and Saemisch, the conjunctivitis follicularis simplex of Raehlmann, the trachoma folliculare of Mandelstamm, and the conjunctivitis follicularis incipiens or trachoma follicularis incipiens of the author, is only a milder or early stage of typical trachoma, into the more severe forms of which it frequently passes. Every form of trachoma may develop, according to Reich, either from direct infection, or from unhealthy hygienic conditions. HIRSCHMANN.

SCHILLING (154) found follicular conjunctivitis in school-children whose parents had trachoma, and catarrhal conjunctivitis in children between the ages of one and six. Frequently one eye was already trachomatous, while the other had follicular conjunctivitis, which soon passed into trachoma, a proof of how the former affection will pass into the latter.

SCHRÖDER (155) removes the follicles from the conjunctiva with a specially constructed wire brush.

STADERINI (156) describes at length his investigations on the etiology, histology, and treatment of trachoma. Positive results were obtained in all cases with cultures on gelatine, prepared from the contents of the trachoma-granules. The diplococcus which he found, and which he calls the trachomacoccus, closely resembles the gonococcus, but is much smaller; introduced under the conjunctiva it produces trachoma, especially in poorly nourished animals. The author has always found the specific coccus in groups of three to nine, and more in the protoplasm of the lymph-cells of trachoma; rarely in the fibrous tissue of the granule, or in the connective tissue of the conjunctiva. As regards treatment, he again recommends the daily brushing with the sublimate solution 1 : 500, and also the instillation twice daily of a solution 1 : 2000. When there is much discharge, nitrate of silver may be used alternately with the sublimate. DANTONE.

THEOBALD (157) thinks the fact that pterygium usually occurs over the tendon of the recti muscles, should lend plausibility to the theory that hyperæmia of the blood-vessels in the vicinity of these tendons, the vascular supply of which is relatively great, has much influence in the development of the condition.

TILLY'S (158) case was that of a boy whose eye trouble began when he was five years old, after vaccination. When seen for the first time, a year after, both eyes were blind, from obliteration of the conjunctiva and adhesion of the lids to the eyeball, and a horny pedicle which covered the front of the ball between the borders of the lids. The puncta were obliterated. Bullæ were found on other portions of the body. The author concludes that this is a case of that rare affection, pemphigus of the conjunctiva.

BURNETT.

VENNEMAN (159) recommends tannin for diphtheritic conjunctivitis. Petresco prefers lemon-juice ; this remedy is thereupon warmly recommended by Abadie ; he cauterizes the whole surface of the conjunctiva with lemon-juice every six hours.

WADSINSKI (160) prefers pressing out the trachoma-granules after Wicherkiewicz, Kramszkyk, and Hotz to every other surgical procedure. He has tried this method on 100 patients, and gives the history of 50 cases treated at the clinic. In 15 cases he obtained very satisfactory, in 24 moderate, results ; 4 cases were failures.

WALLERSTEIN (161) observed an endemic of follicular conjunctivitis in Gelsenkirchen and its neighborhood, where he found a marked swelling of the follicles under the upper lid.

162. ANTOKONENKO, W. A case of dermoid tumor of the cornea. *Wjestnik Ophth.*, 1888, No. 1, p. 23.

163. BOIE. Contribution to the knowledge of keratitis parenchymatosa. From the books of the ophthalmic clinic of the University of Kiel. *Inaug. Diss.*, Kiel, 1888.

164. FIEUZAL. Traitement chirurgical du kératocone. *Soc. franç. d'ophth.*, 1888.

165. GALEZOWSKI. Epithelioma mélanique de la région scléro-cornéenne et sa prédisposition aux recidives. *Rec. d'ophth.*, 1888, No. 1, p. 9.

166. v. HIPPEL, A. A new method of transplantation of the cornea. *v. Græfe's Arch. f. Ophth.*, vol. xxxiv., 1.

167. HIRSCHBERG, J. On specific inflammation of the cornea. *Deutsche med. Wochenschr.*, 1888, Nos. 25 and 26.

168. Manz, W. On destruction of the cornea by infection. *Münchener med. Wochenschr.*, 1888, Nos. 11 and 12.

169. Meyer. Sarcome parenchymateuse de la cornée. *Soc. franç. d'ophth.*, 1888.

170. Michel. On septic keratitis artificially produced. *Sitzungsber. d. Würzburger phys. med. Ges.*, March 17, 1888.

171. van Millingen. On a peculiar form of keratitis in intermittent fever. *Centralbl. f. prakt. Augenhk.*, 1888, No. 7.

172. Parisotti. Kératotomie et paracentèse dans les kératites suppurantes. *Rec. d'ophth.*, 1888, No. 3, p. 165.

173. Perlia. On keratitis bullosa. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxvi., p. 1.

174. Rampoldi. Della cheratite striata che talora segne alla estrazione della cataratta. *Ann. di ottalm.*, vol. xvii., 1, p. 47.

175. Rampoldi. Degli infiltrati patologici della cornea. *Ann. di ottalm.*, vol. xvii., 1, p. 52.

176. Rosmini. Cheratocono monoculare e successivo glaucoma ribelle a due iridectomie e guarito mediante ripetute paracentesi corneali. *Ann. di ottalm.*, vol. xvi., 5–6, p. 425.

177. Scimeni. Ricerche batteriologiche nell' ipopio. *Ann. di ottalm.*, vol. xvi., 5–6, p. 510.

178. Seggel. On staphyloma operation. *Münchener med. Wochenschr.*, 1888, No. 15.

179. Solomon, Vose. Fracture of the cornea from the kick-back of a fragment of a whip-thong. *Brit. Med. Jour.*, 1888, p. 1271. Report of a case with good result.

180. Trousseau. Sur l'origine hérédo-syphilitique de la keratite interstitielle. *Rev. des. sci. med.*, 1888, 1, p. 1.

181. Vacher. Du fer rouge en thérapeutique oculaire. *Soc. franç. d'ophth.*, 1888.

182. Verdese. Contributo alla anatomia patologica dell' ulcus serpens della cornea. *Ann. di ottalm.*, vol. xvii., 1, p. 67.

183. Wagenmann, A. Experimental investigations of the question of keratoplasty. *v. Græfe's Arch. f. Ophth.*, vol. xxxiv., 1, p. 211.

184. Williams. What causes arcus senilis. *St. Louis Med. and Surg. Jour.*, vol. liv., 12, p. 211.

In cases of keratoconus Fieuzal (164) excised an elliptical piece of cornea as recommended by Galezowski ; in three of four cases operated in this manner anterior synechiæ formed. Fieuzal has therefore abandoned this method, and now touches the cornea with the galvano-cautery in cases of keratoconus. Wecker is opposed to this cauterization, as broad scars must be produced before the cornea can be sufficiently flattened.

MARCKWORT.

GALEZOWSKI (165) describes a case of melanotic epithelioma which had almost surrounded the whole cornea like a ring. The neoplasm had once before been removed by an oculist. Galezowski removed it and then treated it with the galvano-cautery ; nevertheless a relapse occurred, whereupon he repeated the operation. (The publication of the case followed so soon that there has been no time for a second relapse to develop.—The Rev.)

MARCKWORT.

v. HIPPEL (166) had found before that in transplantations of the cornea the transplanted flap is destroyed only in exceptional cases. It is sufficiently nourished from the edge to be preserved. The development of new tissue at its posterior surface is a very undesirable, but not necessary occurrence in the process of healing, and speedily destroys the optical result. But the disc may also lose its transparency at an early date without the formation of this tissue from the iris, after its tissue has swollen by imbibition and the epithelium has been more or less cast off. In view of the investigations of Leber on the interchange of liquid in the eye, according to which the transparency of the cornea depends upon the integrity of the epithelium of Descemet's membrane, Hippel concluded that the transparency of the transplanted disc can only be maintained by preserving Descemet's membrane, as thereby the injurious effect of the aqueous is prevented. He therefore performed partial transplantation of the cornea by excising from the leucoma with a specially constructed trephine a piece 4 *mm* in diameter, which he removed from Descemet's membrane with the aid of a Graefe knife. A disc about 1 *mm* in diameter was then excised from the cornea of a dog or rabbit and placed in the defect. The disc became opaque only in those cases in which it had been injured. Only those cases are suitable in which the leucoma does not extend through the whole thickness of the cornea and is not adherent. Among eight cases operated according to this method, Hippel obtained good results in five. From this he concludes that transplantation of the cornea with preservation of its transparency is feasible after his method, that it should be tried even when the leucoma extends through the whole thickness of the cornea, while the total adherent or projecting leucomas must not be touched. The operation is not dangerous, and does not cause the patient much discomfort.

According to HIRSCHBERG (167) diffuse keratitis from congenital syphilis is always accompanied with new formation of bloodvessels, which never disappear. After some time the cornea may appear perfectly transparent to the unaided eye, but under the magnifying glass numerous bloodvessels may be seen ramifying from the margin towards the centre of the cornea and there uniting with those coming from the other side. When the cornea remains slightly hazy, the magnifying glass reveals new-formed blood-vessels as the cause.

MANZ (168) discusses suppuration of the cornea in smallpox, typhoid fever, cholera, xerosis of the conjunctiva, and icterus.

In malaria VAN MILLINGEN (171) observed a keratitis in which there was an erosion at the temporal edge of the cornea. A defect in the epithelium is the first symptom noted. This portion soon becomes hazy. An ulcer forms, which advances towards the centre. The cornea does not perforate. There may be no pain whatever, and the cornea is usually anæsthetic. The whole process is a torpid one, but the ulcer develops rapidly. Recovery by cicatrization is slow. Usually dense opacities of the centre of the cornea remain.

PARISOTTI (172) recommends keratotomy or paracentesis respectively in corneal abscess, serpent ulcer, torpid ulcer, infiltration with hypopyon, etc. Even in simple corneal ulcer he recommends paracentesis (which is going rather too far.—The Rev.).

MARCKWORT.

PERLIA (173) observed a blister containing a clear liquid on the centre of the cornea of a man aged 60. The anterior wall was removed, but a week later a new blister had developed, and another week later a third. The patient was finally cured, but an opacity remained behind.

RAMPOLDI (175) describes two more cases of infiltration of the cornea with blood when the head was inclined forward. In both there was blood in the anterior chamber—in the one the result of an iridectomy made the day before, in the other the result of a traumatic iridodialysis. The latter observation induced the author to make experiments on rabbits. The iris was detached with forceps and the eye enucleated two days later. Even with the naked eye a reddish color of that part of the cornea lying nearest the detached iris was noticeable. When specimens were examined under the microscope, it was found that red blood-corpuscles had entered beneath the endothelium of Descemet's membrane and between the posterior lamellæ of the cornea, while the anterior layers only seemed saturated with lymph.

ROSMINI (176) reports a case of keratoconus in which glaucoma had developed, for which iridectomy was twice performed without success, while once a portion of the keratoconus was abscised. The glaucomatous symptoms, however, disappeared after a series of 30 paracenteses of the cornea, performed by the late Pierd'houy; the keratoconus became flat and vision good. A year and a half later no change was observed. DANTONE.

SCIMENI (177) has investigated the septic effects of hypopyon with the aid of cultures and inoculations. He obtained the material from human eyes affected with hypopyon keratitis, and then from rabbits' eyes in which he had produced purulent keratitis by the introduction of pyogenic cocci, and finally from rabbits' eyes in which the hypopyon had been produced by chemical irritation, especially by the introduction of mercury into the anterior chamber. After numerous experiments he came to the following conclusions: (1) No micro-organisms are found, as a rule, in the hypopyon of small corneal ulcers; but they may be observed in deep and extensive ulcers, even though there may be no perforation of the cornea, and then always belong to the species which has produced the keratitis; (2) as the presence of micro-organisms in the anterior chamber is not necessary for the production of hypopyon, it is probable that the suppuration is due to chemical substances, which are derived from the micro-organisms in the cornea and penetrate into the anterior chamber; (3) sterilized metallic mercury, introduced into the anterior chamber, produces a hypopyon which is entirely independent of micro-organisms.

DANTONE.

SEGGEL (178) operated a straphyloma resulting from blennorrhœa and subsequent perforation of the cornea by inserting a suture around the whole cornea at its margin, splitting the staphyloma with a Beer knife, abscising the two halves with scissors and then closing the wound by pulling the suture tight.

TROUSSEAU (180) found that among 40 cases of keratitis parenchymatosa hereditary syphilis was undoubtedly the cause in 18: in the remainder syphilis was more or less probable.

MARCKWORT.

VERDESE (182) made a careful microscopic examination of an eye affected with beginning hypopyon-keratitis and enucleated post-mortem, and found a small rupture of Descemet's membrane, although the ulcer had only penetrated one third of the thickness of the cornea. The layers behind the ulcer as far as Descemet's membrane were infiltrated with leucocytes, but otherwise unaltered; the iris was entirely normal. The author therefore concludes that hypopyon is always due to bursting of Descemet's membrane and the entrance of leucocytes from the ulcer, though a perforation of the whole cornea is not necessary.

DANTONE.

In making his experiments on keratoplasty WAGENMANN (183) first took flaps from the cornea of rabbits which were left in partial communication with it. They healed in and remained transparent. The flap was nourished by diffusion from the edge. He also cut discs out entirely and then re-attached them in their old places with silk sutures. In three cases the centre of the flap remained clear. A fibrinous substance was found to have united the edges of the wound, and was gradually changed to a firm scar. Nutrition took place by diffusion. Formation of granular tissue was not observed, neither did the flap become vascular. When it becomes opaque infection may be the cause. Another cause may be found in the opening of the anterior chamber. As the endothelium has disappeared, the aqueous causes the tissue to swell, thereby disturbing the nutrition of the cells, as well as of the parenchyma. Flaps the endothelium of which has been removed take root, but they become opaque and remain so. The aqueous may also act, however, from the edges of the wound, thereby causing the margin of the flap to become opaque, which opacity is the greater the more the edges have suffered or the more the lamellæ were forced apart.

185. DUFOUR. Traitement de la sclérite par le salicylate de lithium. *Soc. franç. d'ophth.*, 1888.

186. GAYET. Deux tumeurs symétriques des globes oculaires. *Arch. d'ophth.*, vol. viii., 1, p. 18.

187. NUEL. Des ruptures scléro-cornéennes principalement au point de vue de leur traitement. *Festbundel Donders Jubileum*, 1888, p. 273.

188. WEBSTER, D. A new method of treating episcleritis. *Iuternat. Jour. Surg. and Antisept.*, Jan., 1888.

DUFOUR (185) recommends the salicylate of lithium in scleritis; he thinks this disease is due in the great majority of cases to rheumatism. Panas also obtained good results with it. Grandclément recommends antipyrin in scleritis. MARCKWORT.

GAYET (186) observed in both eyes of a man aged about forty a ring composed of numerous tangent whitish-yellow infiltrations situated at the margin of the cornea. The affection had existed for several years. Every method of treatment, among others also the galvano-caustic, failed. Enucleation finally became necessary, as the severe pain continued even after the eyes had become blind from the total infiltration of the cornea. The posterior portion of the sclera was found to be much thickened in consequence of lymphoid infiltration, which gradually decreased from the optic nerve towards the equator. The uveal tract was also infiltrated with lymph-cells, especially the cornea, which showed fatty degeneration of these elements and formation of vacuoles with atheromatous contents. In other respects the eyes were normal. (For details see the original.) As the infiltration was most marked in the neighborhood of the blood-vessels and the principal changes were found at the posterior pole at the entrance of the ciliary vessels, the author assumes that an inflammatory process started at this point and compares it with the symmetrical orbital tumors previously described by him, there being a striking resemblance in the microscopical structure of the two formations. He therefore makes the diagnosis: lymphoid tumors of an inflammatory nature, which developed in both orbits, but especially at the expense of the eyeballs. v. MITTELSTÄDT.

NUEL (187) does not attempt, like Landesberg, to cure the staphylomas developing after injuries by numerous incisions, but makes a broad sclerotomy through the middle of the staphyloma, preserving, however, a large conjunctival flap and covering the wound with it. The edges of the wound are united with a suture which is introduced subconjunctivally at the equator, crosses the wound, passes around the cornea beneath the conjunctiva, and is tied below. In a patient who had been treated after this method the staphyloma had disappeared after twenty days and the sight had been much improved. WESTHOFF.

WEBSTER (188) has been successful in treating episcleritis by means of the actual cautery. Two applications at intervals of three days have usually been sufficient to effect a cure. Three cases are reported. BURNETT.

189. BOCK, E. Lumps of pigment freely movable in the anterior chamber. Anatomical examination of the whole eyeball. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxvi., p. 163.

BOCK (189) observed in a case during life lumps of pigment freely movable in the anterior chamber. The anatomical examination showed that they consisted of pigmented cells, like those of the uveal layer of the iris. They were most likely remnants of the membrana capsulo-pupillaris, which had become detached from the iris and floated about in the aqueous humor.

REVIEWS.

Dioptric Formulæ for Combined Cylindrical Lenses. Applicable for all angular deviations of their axes, with six original diagrams and one albertype plate. By CHAS. F. PRENTICE. 8vo., pp. 48. New York: James Prentice & Son. 1888. Price, $3.00.

This little brochure is an endeavor to solve the problem of combined cylinders in all its aspects, and in a manner simple enough for the comprehension of the average student of ophthalmology. The author is to be congratulated upon the success that has crowned his labors, for nowhere is there to be found so simple and yet so complete an explanation of the question as is contained in these forty-eight pages.

The author's method of procedure is somewhat different in detail from that pursued by those who have dealt with the subject hitherto. He discusses the question wholly by geometrical construction, and in accordance with the laws of mechanics respecting the resultant of two combined forces acting in different directions—a method peculiarly applicable to the cylinder whose action on the rays of light is always in a direction at right angles to its axis and towards its focal line parallel to the axis. Taking two cylinders then with their axes crossing at any given angle, and we have the following data from which to obtain the properties of the combined lenses, viz.: (1) the angle γ, formed by the crossing of the axes (c_1 C^1 in figure [1]),—planes of nore fraction,—which is equal to the angle formed by the crossing of the planes of greatest refraction; (2) the focal distances f^1 and f^2 (o, o_1 and o, o_2) of the two lenses (c and C) respectively. The final direction of any ray after its passage through the combined lenses will depend upon the relations of these two factors to each other.

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[1] Plate I. reproduced at the end of this volume by permission of the author.

In working out the problem it has been necessary to limit strictly the meaning of certain terms. Thus, the focal plane of each lens taken separately is denominated an *elementary* plane (E_1 and E_2 in the figure), whereas the *primary* and *secondary* planes are taken to be those formed by the action of the two lenses conjointly (YO_1 and XO_2 in the figure). Combined lenses of the same kind (positive or negative) are called, for convenience, *congeneric*, while those of opposite kinds are called *contra-generic.* Now the resultant primary and secondary planes will, according to the parallelogram of forces, lie between the planes, active or passive, of the two combined cylinders, and will of course divide the angle γ into two angles, α and β ; that is to say, $\gamma = \alpha + \beta$. The position of this plane (primary or secondary) in respect to the planes (active or passive) of either of the lenses depends again upon the relation of α to β.

By simple geometrical construction, Mr Prentice shows that

$$\text{Sin } 2\beta = \sin 2\alpha \tfrac{f^1}{f_2}, \ (7)$$

both for the primary and the secondary plane, and from this gets his first proposition—that

"The primary and secondary planes of refraction are at right angles to each other for any angular deviation of the axes of two combined congeneric cylinders."

In examining equation (7) we find that the sines of the double angles differ only by $\frac{f^1}{f_2}$. If $f^1 = f^2$, as in the case where the lenses are of equal power, $\alpha = \beta = \frac{\gamma}{2}$, and hence :

"For combined congeneric cylinders of equal refraction the primary plane equally divides the angle between the active planes of the cylinders, and the secondary plane similarly divides the angle between the axial planes of the cylinders."

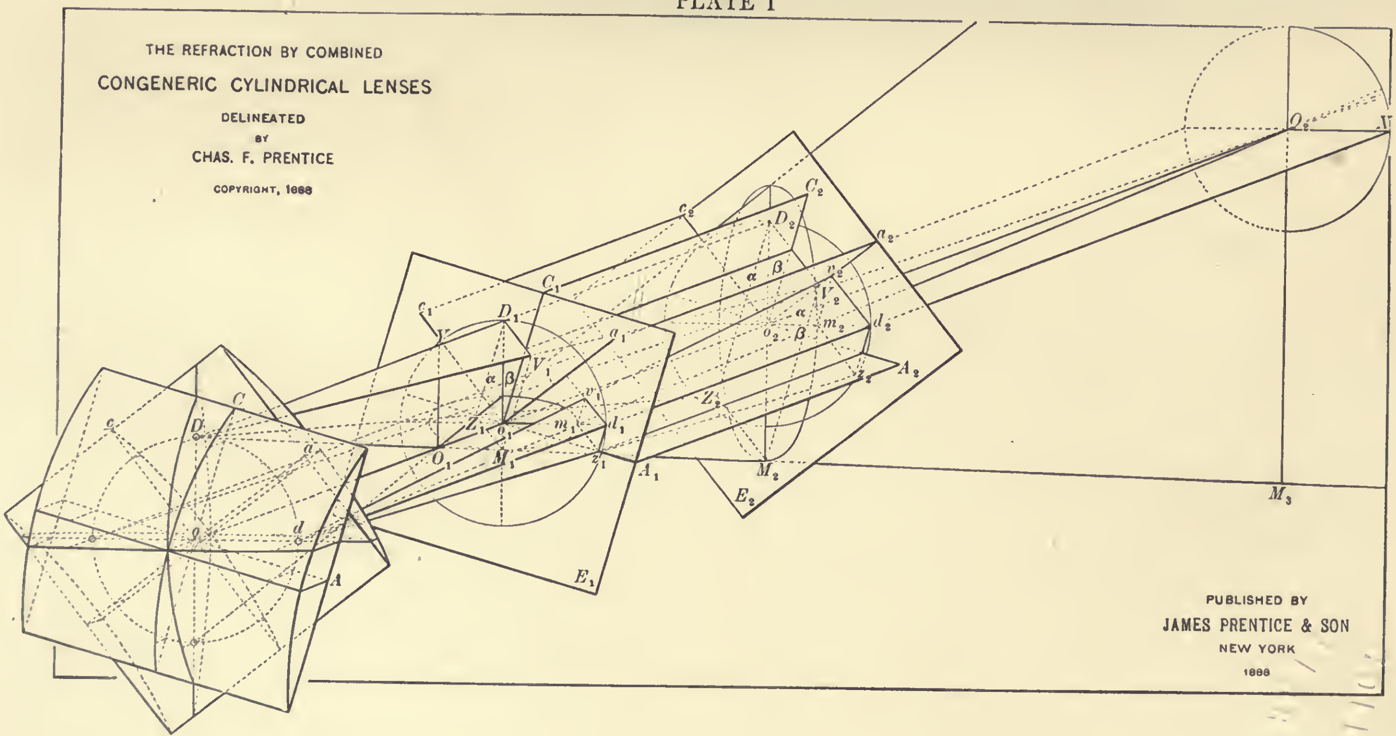
On the other hand, when the cylinders are of unequal refraction "the primary plane will be nearer the active plane of the stronger cylinder."

The equations for obtaining the actual values of α and β are somewhat lengthy, and we give only the resultant :

$$\text{Cos } \alpha = \sqrt{\tfrac{1}{2} + \tfrac{1}{2} \frac{f_1 + f_2 \cos 2\gamma}{\sqrt{f_1^2 + 2 f_1 f_2 \cos 2\gamma + f_2^2}}} \qquad (I)$$

The value of β is found of course by $\gamma - \alpha = \beta$. The direction of the axes of the combination being now known, the position of the focal planes is next to be determined.

PLATE I



THE REFRACTION BY COMBINED
CONGENERIC CYLINDRICAL LENSES
DELINEATED
BY
CHAS. F. PRENTICE

COPYRIGHT, 1888

PUBLISHED BY
JAMES PRENTICE & SON
NEW YORK
1888

The formula, as worked out by the same method for the primary plane, is :

$$F^1 = \frac{f_1 f^2}{\sqrt{\frac{(f_1+f_2)^2}{2} - f_1 f_2 \sin^2\gamma + (f_1+f^2)\sqrt{\frac{(f_1+f_2)^2}{4} - f_1 f_2 \sin^2\gamma}}}. \quad \text{(II)}$$

The value of F^2 for the second focal plane is the same as this precisely, except that there is a minus instead of a plus sign in the denominator between $\sin^2 \gamma$ and $(f_1 + f_2)$.

When the cylinders are of equal power $(f_1 = f_2 = f)$, the formula is reduced to the simple form of

$$F^1 = \frac{f}{1 + \cos\gamma} \quad \text{(IV)},$$

for F^2 it is the same, except that there is a minus instead of a plus sign in the denominator.

From the foregoing formulæ it is shown that when the "axes of the cylinders coincide the primary focal plane is defined by the sum of the refraction of the cylinders, whereas the secondary focal plane will be at infinity"; and, on the other hand, "that the primary and secondary focal planes correspond with the elementary focal planes when the axes of congeneric cylinders of unequal refraction are at right angles to each other."

Another interesting deduction from these formulæ is the fact which has apparently hitherto been overlooked, that "the primary and secondary focal planes are conjugate planes, subject to variations of the angle between the axes of the congeneric cylinders."

The formulæ for the contra-generic cylinders are discussed in the same exhaustive manner, but in accordance with the same general principles, and it is therefore unnecessary to continue them in detail.

Part III. is given to the manner of converting these equations into actual refraction expressed in dioptries. Part IV. considers the sphero-cylindrical equivalence of combined cylinders, showing how all crossed cylinders have their exact expression in a sphero-cylindrical lens. A verification of the formulæ by actual experiment with lenses is given in Part V. The frontispiece is a beautifully executed photograph of a set of models which Mr. Prentice has constructed to exhibit the action of the laws he discusses in his formulæ ; or, to speak more properly, it was the construction of the models which led to the working out of the formulæ.

The six diagrams which serve as illustrations of the geometrical construction (one of which is here given by permission of the author) are marvels of mechanical drawing, and surpass any thing of the kind that has come under the reviewer's notice. S. M. B.

Hand-Book for Opticians. A concise and comprehensive treatise on the theory of the optical trade and of its mechanical manipulations. By W. BOHNE, optician, 119 Canal Street, New Orleans, La., 1888. Price, $2.50.

This book of 107 pages, with numerous diagrams, although written for practical opticians, will be read with benefit also by oculists. It gives much needed information on many points which are neither taught in our medical schools nor mentioned in our text-books. Some of them we may point out. Chapter II. corrects the common error: "Flint glass and rock crystal are harder than crown glass" (Donders). "I do not understand, says the author, how this error could slip into so many medical books, as the simple test of scratching the one with the other will show at once that flint glass is softer than crown glass." This chapter and the next describe the manufacture, composition, and properties of the different kinds of glasses used for lenses. "Crown glass and pebbles are the only rivals for spectacle lenses. Crown glass is the hardest of all glasses, and at the same time much cheaper than flint glass. . . . In rehearsing the merits of pebbles we find that their hardness and clearness surpass those of any glass, and that their dispersing power is the lowest of all lenses manufactured for optical purposes."

Chapter V. describes the manner in which the optical centre of a lens is found, namely, by looking through the lens at a straight line and mark the direction (optical line) on the lens through which the line appears unbroken, then look through the lens when turned 90°, and find again the optical line. The crossing point of these two lines is the optical centre of the lens. Our author says, this important problem had puzzled him greatly at the beginning of his career, yet it has been known for a long time. The reviewer, when a student, learned it from an optician in Heidelberg in 1860, and yet he must say that among the members of the Heidelberg Ophthalmological Society none seemed to know it at that time, and he may add that the test can be made a little more expeditious, as follows: Look through the lens at two lines crossing each other; when the prolongations of the lines beyond the lens are unbroken, the point of the lens through which we see the crossing point of the lines is the optical centre of the lens. The decentration of glasses rests on the same experiment.

Chapter VIII., measuring of compound lenses and their correct setting, is the most useful for the oculist. How often have we to determine the kind and strength of spectacles worn by patients who have no formula with them. The problem for spherical glasses is indeed easy enough, but when we have to deal with sphero-cylindrical, or sphero-cylindro-prismatic glasses, the problem is not so simple, though it can always be solved by determining the optical centre of spherical and the axis of cylindrical glasses while watching the apparent motions of objects seen through the moving lens; further by determining the focal length either directly or by the magnifying or diminishing effect, comparing it with lenses of known strength, and again watching the apparent movements of objects through the neutralized pair of lenses. All these rules—which are well known, it is true—are plainly detailed by our author and exemplified by a number of drill problems.

Chapter XI., the proportion of caloric rays in the different kinds of light, describes some very interesting experiments.

The other chapters, though pleasant reading, do not add much to the stock of knowledge possessed by an oculist of average education.

We can fairly recommend the book, though its price, $2.50 for 107 pages, is out of proportion. H. K.

The Transactions of the Seventh International Ophthalmological Congress, held in Heidelberg last August, have appeared in a volume of 538 pages, edited by O. Becker and W. Hess. Published by F. I. Bergmann, Wiesbaden.

This congress was the most successful ophthalmological gathering ever held. The papers and discussions represent the actual standpoint of ophthalmology more fully than those of any national society can do. They are printed in the languages of the authors, and treat of almost all important questions in ophthalmology. We need not recommend this volume to our readers, for it seems self-evident that every oculist will read and study it for himself; so much the more, as the reports of the congress that have appeared in different periodicals have been singularly imperfect, most of them reprinting only the extracts which a number of speakers distributed on slips of paper, whereas a good deal of original work, not made so convenient for the reporters, was left either unmentioned or spoken of incorrectly. To return to the source is in this case particularly desirable, for the members of the congress pledged themselves to publish their papers in the Transactions only—a rule which ought to be adopted in all societies that publish their proceedings. H. K.

In Memoriam.

ELKANAH WILLIAMS, A.M., M.D., OF CINCINNATI.

Death has recently claimed several eminent members of the medical profession, and conspicuous among them is the name of Dr. E. Williams, of Cincinnati.

In the specialty of the diseases of the eye, he was one of the pioneers, as he quit general practice in 1852 and went abroad for better opportunities of study and observation than he could obtain at home. He spent about two years and a half in Germany, France, and England, visiting the various clinics and hospitals. The time chosen was fortunate, as ophthalmology was then undergoing a process of evolution from an obscure and uncertain specialty to a tolerably well-defined exact science. This change was brought about by the invention of the ophthalmoscope, which cast its welcome light into a cavity which before had been dark, except to post-mortem sections. Ideas of intraocular diseases were revolutionized as well as their treatment.

Dr. Williams was fortunate enough to study with Arlt, Jaeger, Von Graefe, Sichel, and Desmarres, during the period of these new developments. He had the honor to demonstrate the use of the ophthalmoscope to the staff of the Moorfields Hospital, London.

He returned to Cincinnati in 1855, and began to practise. His progress at first was slow, as the profession had not learned to appreciate the value of a specialist, but his superior qualifications soon became manifest, and erelong he had substantial evidences of his professional success. His genial manner, his kindly face, his high professional attainments, his sympathy for his patients, combined to give him qualities which made him popular among his clients.

He was Professor of Ophthalmology in the Miami Medical College after its reorganization in 1865, and held this position until failing health compelled him to give it up. For many years he served as oculist on the staff of the Cincinnati Hospital.

During the early years of his practice he was a frequent contributor to the medical journals, but during later years, as his professional work increased, he wrote less frequently. As a lecturer he excelled ; his flow of language was easy, and his intimate knowledge of the literature of his specialty, and his extensive experience, made his clinical and didactic lectures very attractive to students as well as practitioners.

He was an honorary member of the Medical Society of Athens, Greece, and also of the Ophthalmological Society of the United Kingdom. In 1875 he was elected President of the Medical Society of Ohio. In 1876 he was Chairman of the section of Ophthalmology of the Medical Congress which convened at Philadelphia.

He has left the record of a pure and earnest life, devoted to his profession. His name was extensively known in Europe and this country, and his professional success was phenomenal, but it was a success which he had earned and which he well deserved.

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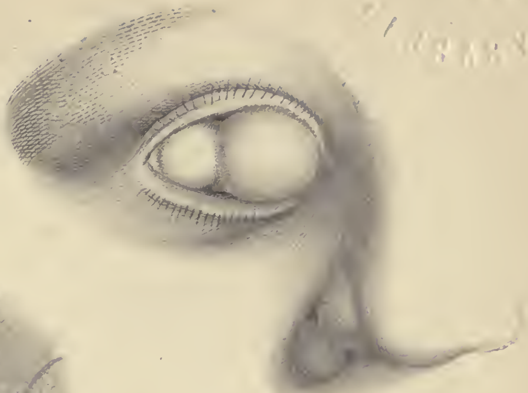

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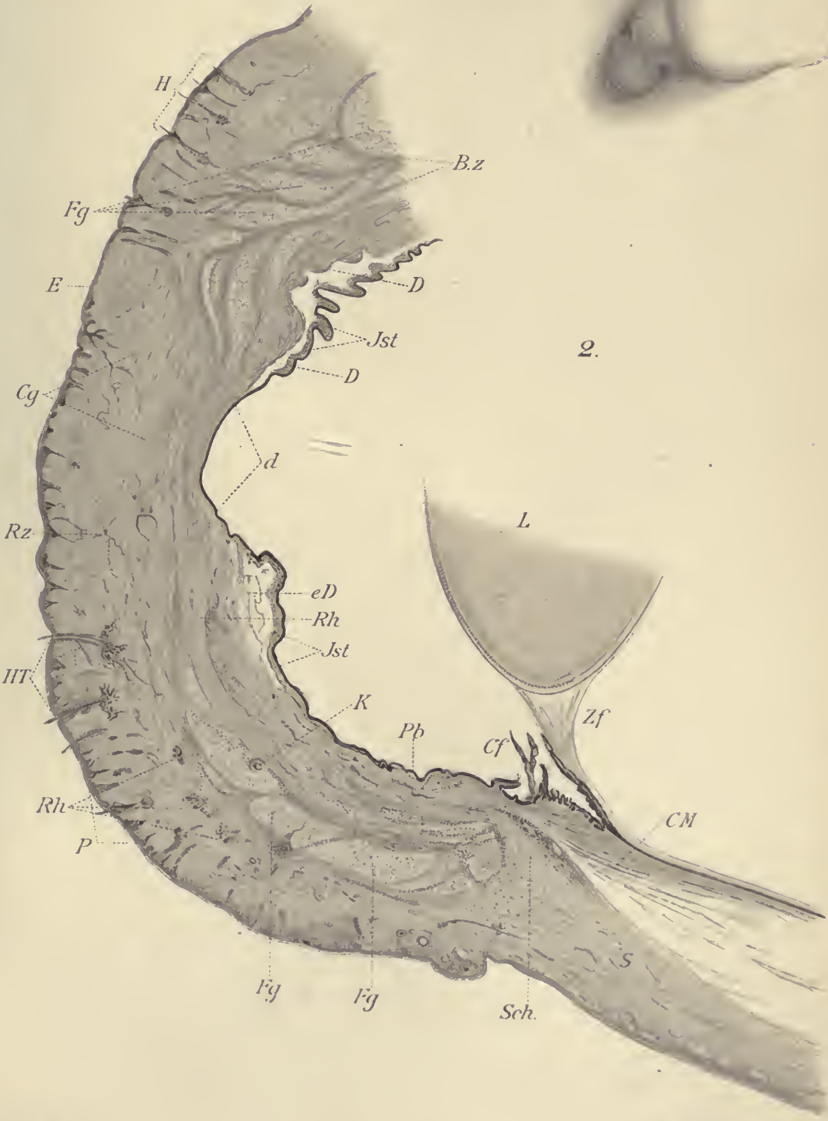

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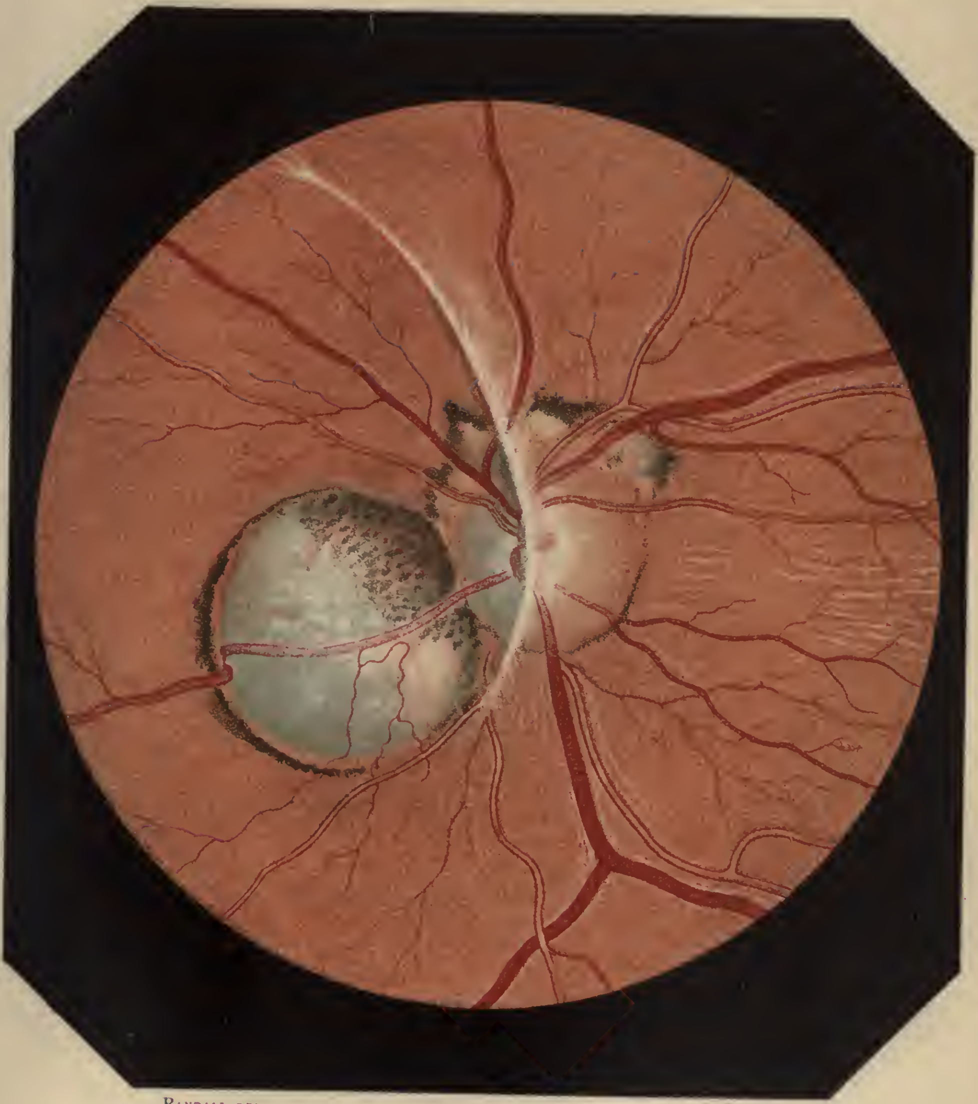

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